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DOMINION OF CANADA—DEPARTMENT OF AGRICULTURE

DAIRY FARM BUSINESS

IN

ALBERTA

1939 to 1943

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H. L. PATTERSON

Marketing Service—Economics Division
Dominion Department of Agriculture

in co-operation with

Dairy Branch, Department of Agriculture, Alberta
Board of Public Utility Commissioners, Alberta
Department of Political Economy, University of Alberta



Published by Authority of the Rt. Hon. JAMES G. GARDINER, Minister of Agriculture,
Ottawa, Canada

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FOREWORD

The first evidence of interest in a study such as that outlined here is difficult to trace as it involves many different personalities and many different organizations and public departments, each feeling the need for further information at different times and places. In 1931, twelve farms shipping whole milk to Calgary kept records for a few months and from May 1, 1932 until May 1, 1933, seven dairymen in the Edmonton milk shed kept records and in each case the records were made available to the Board of Public Utility Commissioners. In 1937, the Alberta Legislature named a committee of five members to investigate the situation in the whole milk sheds of Alberta. This committee after a study of the situation in the Calgary and Edmonton milk sheds made a report to the Minister of Agriculture for Alberta. Two of the paragraphs in this report are pertinent to this study. First, it was stated that in the opinion of the committee, "no adequate effort has been made to ascertain the cost of production. We believe that no practical method of price fixing could be maintained unless such costs are known." Later in the report it was recommended that, "a survey of this sort should be associated with herd improvement work which we understand is under consideration by the Dairy Branch of the Alberta Department of Agriculture at the present time." At the next session of the Alberta Legislature the enabling legislation and an appropriation for the costs of the study were passed. The aid of the Dominion Department of Agriculture through its Economics Division was sought and was granted on the basis that the study should include cream and cheese farms as well as whole milk and inspected cream farms, and that the study should enquire into all things pertinent to the operations of the dairy farm business.

The organizations of dairy farmers supported the development of the study through all the official stages of its initiation, and then aided in the securing of an adequate sample of the farms shipping whole milk to the Edmonton market. The Board of Public Utility Commissioners financed a substantial part of the provincial share of the costs and also contributed valuable information and advice. D. H. McCallum, Dairy Commissioner, Alberta Department of Agriculture, and Professor Andrew Stewart of the University of Alberta, were responsible for the province's share of the supervision of the study and their help and advice was gratefully received. In the conduct of field work and in the analysis of records the author was assisted by Howard W. Trevor and J. L. Anderson of the Dominion Department of Agriculture, and at different periods of time by Thomas W. Clarke, V. I. Macdonald, and B. J. McBain of the Alberta Department of Agriculture. To all the above persons and to the farmers who co-operated in keeping the accounts, the author is greatly indebted. Without their joint co-operation this study would not have been possible.

SUMMARY AND CONCLUSIONS

The major objective of the study was to determine the factors affecting the earnings of Alberta dairy farm operators. The study was based on records kept on Alberta farms producing whole milk, cream or milk for condensed milk and cheese. The study included 872 annual farm records from June 1, 1939 to 1943. It covered a period of rising prices although the rise due to the war was greatest after the study ended in 1943. The index of prices for livestock products was below the previous 31-year average for the first three years of the study.

Commercial dairy production in Alberta started with the opening of the first cheese factory near Calgary in 1888. Alberta now produces more butter and cheese than is needed in the province and ships large quantities to other provinces, besides meeting all local needs for whole milk and fluid cream.

The farms were selected from complete lists of producers available at milk supervisors' offices or at processing plants. Soils maps also were used to secure a representative distribution. The farms were grouped by markets for purposes of analysis. The basis of cost used was the alternative opportunity. For labour this meant the prevailing pay for hired help.

The measure of success used was the operator's labour earnings. The unit of cost in the dairy was a pound of butterfat. This cost can be converted to 100 pounds of whole milk at 3.6 test by multiplication.

PART I

WHOLE MILK AND INSPECTED CREAM SHIPPERS

WHOLE MILK AND INSPECTED CREAM FARMS.—As the dairy enterprise was usually the major enterprise on whole milk and inspected cream farms these were studied separately from the processed milk producing farms where dairying usually represented less than 50 per cent of the receipts. The whole milk and inspected cream farms had averages of from 336 to 662 total acres per farm and from 218 to 288 acres cropped. The same groups averaged from 46 to 85 animal units per farm in 1941.

The difference in the operator's labour earnings are due to many factors—prices of farm products, cost of farm requirements, size of business and also to the organization and management of the farms. More variation occurred within groups each year than was found between group averages during the four years of the study, indicating that organization and management is the biggest cause of variation.

Higher labour earnings may be obtained by increasing receipts or lowering costs or a combination of both. Farm receipts must come from the sale of crops or livestock and their products. Farm expenses all represent outlays of labour or capital, including working capital and carrying charges on long time investment. Therefore, the analysis was presented as the relation to costs and success, of efficiency in the management of: (1) livestock, (2) crops, (3) labour, (4) capital. This is followed by a discussion of the relation to earnings of (5) size of business and (6) combination of enterprises.

LIVESTOCK.—In general, higher production of butterfat per cow was associated with higher labour earnings and lower cost per pound of butterfat. Higher feeding efficiency as measured by dollar returns per \$100 worth of feed fed was

associated with much lower costs per pound of butterfat produced. Livestock index, based on returns per animal unit, was directly associated with labour earnings.

CROP YIELDS.—The general relation was for higher yields to be associated with higher labour earnings. However, higher crop yields were associated with lower crop acreages and a larger number of animals per 100 acres of crops and these prevented the relationship appearing as strongly as it might have otherwise done.

LABOUR USE.—Labour available on farms decreased during the period of study. The Edmonton whole milk farms changed from almost 100 per cent hand milking in 1939 to over 80 per cent machine milking in 1943. The man hours of chores per pound of butterfat fell from 1.0 to 0.7 hours. All measures of labour efficiency indicated that it had a strong relation to labour earnings.

CAPITAL EFFICIENCY.—Total capital per farm in 1941 ranged from \$17,845 to \$39,346. The necessity of acquiring so much capital provides many problems of management. The labour earnings rose with increased total capital on the whole milk farms. The trend was similar but less marked with inspected cream farms.

The farms were sorted by turnover on capital (the number of years for present cash receipts to equal capital). The groups of farms with the most rapid turnover of capital had the highest labour earnings.

SIZE OF BUSINESS.—Variation in size of farm business was measured by crop acres, total acres, crop acres adjusted for pasture, total capital and total animal units. Each measure indicated a stronger relation between size and labour earnings on whole milk farms than on inspected cream farms.

The farms were grouped by the number of cows kept. The Edmonton area farms showed first a decrease of earnings as numbers increased and then a rapid increase with the largest sizes of herds. In the Calgary area earnings increased with the increased number of cows kept. Hogs were the most profitable livestock in the Edmonton area and dairy cattle were the most profitable in the Calgary area. In each area an increase in the size of the least profitable enterprise meant a decrease in the most profitable enterprise. However, with both hogs and cows the highest earnings were associated with the largest enterprises.

COMBINATION OF ENTERPRISES.—In the Calgary whole milk group of farms the highest earnings occurred where there were the most receipts from dairying and the least from hogs. In the Edmonton area the highest earnings on small farms came where there were the most receipts from hogs and the least from dairying. On the large farms the highest earnings were associated with the most cows although this group of farms had the most hogs as well.

COMBINED EFFECT OF EFFICIENCY FACTORS.—The farms were sorted on the basis of the number of factors affecting earnings that each had above average. As the number of factors increased from none above average (0) to 5 factors above average, the average labour earnings increased. For whole milk farms in 1942-43 this increase was from -\$620 to \$5,292. The factors used were butterfat per cow (livestock efficiency) crop yield index, receipts per man, (labour efficiency), years for cash receipts to equal capital (capital efficiency) and crop acres (size). Similar results were obtained in each group and in each year of the study.

PART II

PROCESSED MILK PRODUCERS

The processed milk farms averaged 113 cropped acres per farm on irrigated land and 237 acres on dry land. On these two groups of farms, the total acres averaged 225 and 393, respectively. Labour earnings were lower on the average than with whole milk farms, and they varied just as much, from farm to farm and for similar reasons, as those of the whole milk and inspected cream farms.

LIVESTOCK EFFICIENCY.—Livestock index showed the strongest relation to labour earnings of the livestock efficiency measures. This measure includes hogs which were usually the most important source of income on processed milk farms.

CROP YIELDS.—The crop yield index was directly related to labour earnings and also to the number of animals per 100 acres of crop land.

LABOUR EFFICIENCY.—All measures of labour efficiency were strongly related to the operator's labour earnings, especially in the later years when higher wages prevailed.

CAPITAL EFFICIENCY.—Years for cash receipts to equal capital was closely related to labour earnings. The total capital per farm was also closely related to labour earnings.

SIZE OF BUSINESS.—The farms with the largest businesses had the largest labour earnings except where the large size was associated with low crop yields or where all other efficiency factors were low.

COMBINATION OF ENTERPRISES.—The highest earnings occurred on farms having the least dairy and the most hogs on cheese and cream farms. Condensery farms displayed less disadvantage with concentration on dairying and less advantage from an increase in hogs.

PART III

TYPES OF DAIRY FARMS IN THE MAIN AREAS OF PRODUCTION

The wide differences found in feeding and breeding practices are related to the area in which they are found and to the available market. Whole milk farms have exacting requirements of time and regularity of delivery. They enjoy higher prices and tend to develop dairying more intensively than processed milk shippers.

Most of the dairy production of Alberta is carried on in the northern areas in the black or grey soil zones. Relatively little dairying is found in the short-grass plains except where there is irrigation and there, alfalfa is a major crop and fits well with dairying. Thus milk production tends to be concentrated in the moister soil zones or areas. This is due to the greater adaptation of forage crops to those areas and to the difficulty of securing enough cheap pasture close to the barn in a dry area.

Churning cream comes mostly from herds too small to warrant daily delivery, or those kept in combination with crop enterprises the peak labour requirements of which may necessitate neglecting the dairy on occasion. Dairy cows are found usually on rolling land in the areas of highest soil moisture. Concentrated hog production is located usually in the flat lands in the moister areas that have an advantage in barley production. Hog production was related to the number of cultivated acres per farm but not to the number of milk cows.

DAIRY FARMING IN ALBERTA

INTRODUCTION

Purpose

The major objective of the study was to determine the factors affecting the earnings of dairy farm operators. More particularly it included the study of:

- (a) General organization and management of the farms.
- (b) Dairy enterprise costs and returns.
- (c) Variations in costs and returns, and the reasons for those variations.

The objectives included making information gained freely available to the farmers co-operating in the study, to extension service workers, to the University of Alberta, to administrative offices such as that of the Dairy Commissioner, and the Milk Control office of the Board of Public Utility Commissioners, and to the Agricultural Food Board, Ottawa.

Economic Conditions

PRICE RELATIONS.—The period of time in which a study is made is important because of the effect on an industry of constantly changing price relations. Changes in demand and supply for the goods that industry produces may cause loss with a tendency to contract production, or gains sufficient to encourage expansion. Since dairy farms have other enterprises besides dairying the prices of other farm products relative to the prices of dairy products may have a marked effect on decisions to expand or curtail production. In Table 1 is given the wholesale price indexes as computed by the Dominion Bureau of Statistics. The period of the present study was from June 1, 1939 to May 31, 1943. The average indexes shown for the 31-year period, 1913 to 1943, were: for field products, 82.1; for animal products, 96.7; and for farm living costs, 112.6. For the 22-year period shown the average index of price of commodities and services used by farmers was 115.2. The annual indexes were below this average in 1939, 1940 and 1941 and above in 1942 and 1943. From 1939 to 1943, inclusive, the index of field product prices was below the 31-year average every year, the animal product prices were below the long-time average during 1939, 1940, and 1941, and above in 1942 and 1943. The farm living costs were below the long-time average during 1939 and 1940 but above during 1941, 1942, and 1943.

TABLE 1.—ANNUAL INDEX NUMBERS

Indexes of Wholesale Prices, Living Costs, and Prices of Commodities and Services used by Farmers computed by Dominion Bureau of Statistics.

Year	Wholesale Prices 1926=100			Retail Prices			
	All commodities (1)	Farm products (2)	Field products (3)	Animal products (4)	Urban Living Costs 1935-1939 =100 (5)	Farm Living Costs 1935-1939 =100 (6)	Commodities and Services Used by Farmers (7)
1913.....	64.0	64.1	56.4	77.0	79.7	79.6	.....
1914.....	65.5	70.2	65.4	78.3	80.0	82.0	.....
1915.....	70.4	77.9	76.9	79.5	81.6	86.3	.....
1916.....	84.3	89.8	88.8	91.4	88.3	93.6	.....
1917.....	114.3	128.5	134.5	118.4	104.5	111.6	.....
1918.....	127.4	132.6	132.0	133.6	118.3	131.4	.....
1919.....	134.0	146.7	142.6	153.5	130.0	143.0	.....
1920.....	155.9	160.6	166.5	150.8	150.5	170.7	.....
1921.....	110.0	103.7	100.3	109.5	132.5	139.5	.....
1922.....	97.3	88.0	81.4	99.0	121.3	127.5	133.2
1923.....	98.0	81.5	73.3	95.1	121.7	127.9	128.7
1924.....	99.4	88.1	82.7	97.2	119.5	125.1	132.6
1925.....	102.6	101.0	98.2	105.6	120.6	123.6	131.8
1926.....	100.0	100.0	100.0	100.0	121.8	120.9	129.3
1927.....	97.7	102.1	99.9	105.7	119.9	119.5	130.1
1928.....	96.4	100.7	92.6	114.3	120.5	118.3	128.2
1929.....	95.6	100.8	93.8	112.5	121.7	117.4	127.5
1930.....	86.6	82.3	70.0	102.9	120.8	113.7	116.3
1931.....	72.1	56.3	43.6	77.6	109.1	103.7	100.8
1932.....	66.7	48.4	41.1	60.7	99.0	97.7	93.4
1933.....	67.1	51.0	54.8	59.7	94.4	95.7	90.0
1934.....	71.6	59.0	53.8	67.7	95.7	97.8	96.0
1935.....	72.1	63.5	57.3	74.0	96.2	97.9	96.0
1936.....	74.6	69.4	65.8	75.3	98.1	98.3	98.0
1937.....	84.6	87.1	88.3	85.0	101.2	102.9	105.4
1938.....	78.6	73.6	69.0	81.3	102.2	102.0	101.5
1939.....	75.4	64.3	54.2	81.2	101.5	99.5	99.1
1940.....	82.9	67.1	55.9	85.2	105.6	108.6	105.7
1941.....	89.9	71.2	56.5	95.8	111.8	114.2	114.1
1942.....	95.6	82.5	66.5	109.2	116.8	119.2	128.0
1943.....	99.9	95.9	81.6	119.9	118.4	121.7	136.0

(1) See Prices and Prices Indexes 1913-1928, pp. 19-21, 270-289 and 1913-1939, p. 17.

2. Wholesale prices of Canadian products of farm origin only. See Prices and Price Indexes 1913-1937 p. 52, and Monthly Mimeographs 1942-43.

3. Wholesale prices of grain, fruits and vegetables.

4. Wholesale prices of animals and animal products.

5. See An Official Cost of Living Index for Canada, 1940.

6. Index numbers of Farm Family Living Costs 1913-38 and Farm Living Expenditures 1934 and Farm Family Living Costs mimeograph.

7. Indexes include prices of commodities of the following groups: farm implements, building materials, gasoline, oil and grease, feed, fertilizer, binder twine, seed, and hardware, besides tax rates, interest rates, and farm wage rates. From 1940 to 1943 the indexes shown are the averages of the indexes for April and August, as computed by the Dominion Bureau of Statistics.

TABLE 2.—THE DAIRYING INDUSTRY OF ALBERTA¹
(Provincial statistics not recorded prior to 1906)

Year	Number of Cows	Creamery Butter			Factory Cheese			Total Value of all Dairy Products ²
		Number of Creameries	Total Production	Average Price per Pound	Number of Factories	Total Production	Average Price per Pound	
			Lb.	Cents		Lb.	Cents	\$
1906.....	101,245	42	1,960,356	21-21	7	97,739	13-30	2,000,000
1910.....	124,470	60	2,238,078	25-69	11	220,000	12-50	7,855,761
1915.....	183,974	57	7,544,148	26-79	13	381,832	17-93	15,895,586
1919.....	336,596	53	11,822,890	51-87	10	520,530	27-90	31,625,000
1920.....	305,607	53	11,821,291	55-45	7	398,750	27-70	34,000,000
1921.....	423,838	44	13,048,493	34-82	10	930,660	21-54	25,500,000
1922.....	392,037	54	15,417,070	33-25	14	931,992	19-73	22,950,000
1923.....	410,242	75	17,868,853	32-97	13	1,865,608	19-77	22,975,000
1924.....	433,528	89	22,339,857	31-60	12	1,714,790	16-24	23,208,562
1925.....	460,722	99	19,630,101	35-45	14	1,473,835	20-80	23,002,000
1926.....	436,500	99	19,912,466	32-96	15	1,449,983	18-97	21,820,000
1927.....	380,000	100	16,179,712	35-63	12	848,511	20-12	20,750,000
1928.....	344,495	100	14,375,636	37-38	9	722,048	21-94	20,350,000
1929.....	345,566	95	16,004,463	36-39	10	1,001,475	19-78	20,750,000
1930.....	348,297	92	17,716,744	28-04	8	1,035-352	16-94	18,675,500
1931.....	385,000	93	22,957,922	20-52	10	1,040,588	11-38	15,750,000
1932.....	424,000	95	21,016-048	16-71	12	1,439,715	10-15	11,850,000
1933.....	406,520	96	23,852,350	18-10	11	1,437,387	10-40	12,950,000
1934.....	461,700	96	25,601,447	18-80	11	1,370,425	11-20	14,391,204
1935.....	464,200	97	23,094,707	19-90	11	1,364,526	12-33	14,525,500
1936.....	458,200	96	25,491,105	21-69	12	1,451,735	13-00	15,505,800
1937.....	453,600	96	26,323,562	24-50	14	1,838,589	14-60	17,137,900
1938.....	440,900	97	31,242,357	22-91	15	2,451,821	14-21	18,587,918
1939.....	429,200	96	29,749,958	21-06	19	2,196,157	12-03	18,069,733
1940.....	416,800	95	27,796,520	22-31	18	2,705,853	14-25	19,532,344
1941.....	362,064	94	35,316,143	30-55	18	3,140,978	19-55	27,376,772
1942.....	366,800	94	36,985,809	32-00	20	3,908,545	21-58	31,574,838
1943.....	376,000	94	38,656,940	31-75	18	2,563,257	22-10	34,448,814

¹ Data supplied by the Dairy Commissioner, Department of Agriculture, Edmonton.

² Including milk and cream for direct consumption; ice cream; home-made butter and cheese; skim milk; buttermilk and concentrated milk products.

Table 2 gives the production and average prices in Alberta for creamery butter production and factory cheese production from 1919 to 1943, inclusive. The averages of the annual prices were 29·86 cents per pound for creamery butter and 17·52 cents per pound for cheese. The prices paid for creamery butter and cheese were below the 25-year average in 1939 and 1940, and above that average for the last three years of the study. The prices quoted are the prices received at the factory for finished products and do not include the subsidies of the Dominion Government for the production of these products. The effect of government regulations on price and, through price, on production will be discussed under Regulations Affecting Production.

PRODUCTION.—*Historical*.—Alberta dairy production began with the earliest development of the country. The 1885 Census of the Northwest Territories reported 3,334 dairy cows in the three census divisions of the Provisional District of Alberta with a production of 85,795 pounds of butter and 1,075 pounds of cheese. All production at this time was on farms and sold locally. In the later eighties, the gradually increasing output had overtaken the requirements of some local markets, causing a serious drop in prices. This condition seems to have reached an acute stage in the Calgary district first. Farm-made butter would not stand long shipment so the answer to the surplus problem seemed to be to seek wider markets through the sale of the products of dairy factories. Ebenezer Healy, a settler in the Springbank area, west of

Calgary, set up a cheese factory on his farm in 1888. This was the first dairy factory in Alberta. This factory was shortly followed by the erection of other cheese factories and later by creameries. The creameries have since increased their output more rapidly than the cheese factories as may be seen by Table 2. The trend of Alberta dairy production has been definitely upward with the only marked recession occurring from 1926 to 1929 a period of relatively good prices for field crops, particularly grain. Alberta has exported butter for many years and also produces some cheese in addition to that consumed in Alberta.

Whole milk production has expanded to keep pace with the needs of the growing population. The trends of whole milk production are more difficult to trace as the quantity required and the method of handling depend so much on local arrangements. The first city pasteurizing plants in Alberta were started at Edmonton in 1906 and at Calgary in 1909. Since that time there has been a slow but steady shift towards more pasteurized milk in all the larger centres. There are still a number of producer-distributors selling unpasteurized milk particularly in the smaller centres, and since conditions of distribution and local health inspection standards vary so greatly across Alberta, figures on average prices paid to producers would not mean very much. The fluid milk sales, as shown by the reports of the Board of Public Utility Commissioners, in the three largest centres of Alberta are given in Table 3 and the fluid cream sales are given in Table 4. The number of licensed whole milk producers by markets is given in Table 5 and the number of licensed milk and cream distributors in Table 6.

TABLE 3.—FLUID MILK CONSUMPTION IN CITIES OF EDMONTON, CALGARY AND LETHBRIDGE, 1938-1942 ¹

Area	1938	1939	1940	1941	1942
	Quarts	Quarts	Quarts	Quarts	Quarts
Calgary.....	8,834,126	8,983,853	9,364,294	10,043,712	11,967,311
Edmonton.....	10,238,447	10,349,471	10,381,263	10,823,425	11,763,647
Lethbridge.....	1,415,470	1,440,907	1,488,834	1,517,788	1,503,589
Totals.....	20,488,043	20,774,231	21,234,391	22,384,925	25,234,547

¹ Annual Report of the Dairy Commissioner and a Report of the Board of Public Utility Commissioners Concerning Milk Control for the Province of Alberta, 1942, Table 4, p. 19. Edmonton, Alberta. 1943.

TABLE 4.—FLUID CREAM CONSUMPTION IN CITIES OF EDMONTON, CALGARY AND LETHBRIDGE, 1938-42 ¹

Area	1938	1939	1940	1941	1942
	Quarts	Quarts	Quarts	Quarts	Quarts
Calgary.....	849,611	860,197	907,358	967,339	949,838
Edmonton.....	976,039	976,598	962,929	962,911	934,799
Lethbridge.....	95,627	93,824	101,691	104,357	117,780
Totals.....	1,921,277	1,930,619	1,971,978	2,034,607	2,002,417

¹ Annual Report of the Dairy Commissioner and a Report of the Board of Public Utility Commissioners Concerning Milk Control for the Province of Alberta, 1942, Table 5, p. 19. Edmonton, Alberta, 1943.

TABLE 5.—NUMBER OF MILK AND CREAM PRODUCERS OPERATING ON DECEMBER 31st, 1942, UNDER THE BOARD OF PUBLIC UTILITY COMMISSIONER'S LICENCE ¹

Controlled Area	Milk	Cream	Total
Calgary.....	196	111	297
Camrose.....	8	8	16
Crow's Nest Pass.....	6	1	7
Lethbridge.....	24	7	31
Edmonton.....	188	77	265
Red Deer.....	18	20	38
Totals.....	430	224	654

¹ Annual Report of the Dairy Commissioner and a Report of the Board of Public Utility Commissioners Concerning Milk Control for the Province of Alberta. 1942, Table 7, p. 19. Edmonton, Alberta. 1943.

TABLE 6.—NUMBER OF MILK AND CREAM DISTRIBUTORS OPERATING ON DECEMBER 31st, 1942, UNDER THE BOARD OF PUBLIC UTILITY COMMISSIONER'S LICENCE ¹

Controlled Area	Milk	Cream	Total
Calgary.....	11	2	13
Camrose.....	2		2
Crow's Nest Pass.....	7		7
Edmonton.....	27	3	30
Lethbridge.....	4	1	5
Red Deer.....	4		4
Bowden.....	1		1
Totals.....	56	6	62

¹ Annual Report of the Dairy Commissioner and a Report of the Board of Public Utility Commissioners Concerning Milk Control for the Province of Alberta, 1942, Table 8, p. 19. Edmonton, Alberta. 1943.

Geographical Distribution of Production.—The farms producing whole milk for human consumption are located near the markets they serve. For example, until the war stepped up the demand for whole milk, the Edmonton City Health Department confined their inspections of whole milk farms to an area within a radius of fifteen miles from the city. Prior to the outbreak of World War II the Calgary milk shed had a radius of about 20 miles but 80 per cent of the required fluid supply came from the rolling land north and west of the city. Extraordinary wartime demands, however, necessitated an extension of the area to 50 miles and milk coming to Calgary from that distance is usually shipped by rail.

Inspected cream farms are usually located a little farther out from the cities than the whole milk farms or on less accessible roads. They usually deliver every second or third day and ship cream rather than whole milk.

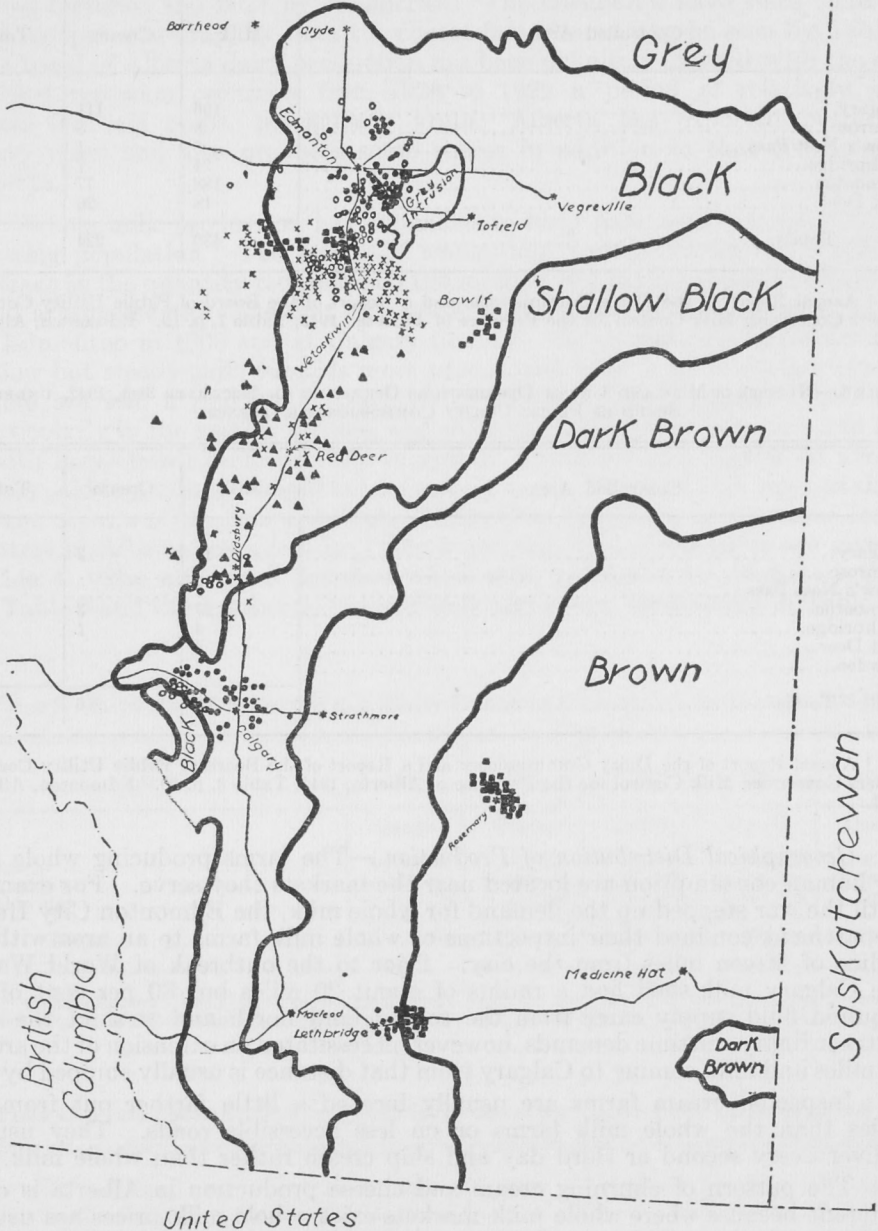
The pattern of churning cream and cheese production in Alberta is quite different because where whole milk markets exist, whole milk prices are usually high enough to outbid creameries or cheese factories. Because it is a concentrated product, cream can be shipped long distances and some of the largest creameries are located in large centres. Cheese factories are located near where the milk is produced and both churning cream and cheese milk tend to be produced on farms at some distance from large centres of population.

Figure 1 shows the generalized soil zones of Alberta. It may be noted that all four major zones are represented about equally in Alberta. The grey forest zone covers the largest area with the black soil zone slightly the smallest.

ALBERTA DAIRY STUDY

WITH

LOCATION OF CO-OPERATORS IN GENERALIZED SOIL ZONES



EXPLANATORY NOTES

Shippers of Churning Cream.....	x
Shippers of Whole Milk.....	•
Shippers of Inspected Cream.....	○
Shippers of Milk for Cheese.....	◻
Shippers of Milk to Condensery.....	▲
Location of Cities and Towns.....	*
Location of Main Highways.....	-

Unpublished material, P. F. R. A. Soils Research Surveys, Dominion Department of Agriculture and the Soils Department, University of Alberta.

Over half of the dairy production of Alberta occurs in the black soil zones. The dark brown and grey soils are secondary, and the light brown soils of still less importance in dairy production. The reasons for this peculiar pattern are discussed later in this report. The sample and areas to be studied were chosen from the soil zones or local regions where dairying is of greatest importance in Alberta.

The first group of churning cream and cheese farms selected for study was mainly in the black soil zone south of Edmonton with a few farms from the grey soils to the west and a few from the dark brown soils to the east. Later, farm records were also set up at farms on irrigated land, shipping milk to the Rosemary and Coaldale cheese factories.

The Central Alberta Dairy Pool condensery patrons were included in the study together with several cream shippers from the same district during the fourth year of the study.

Regulations Affecting Production.—Local or municipal controls affecting production are usually confined to Acts intended to preserve the public health. In Alberta this means the inspection and licensing of farms producing whole milk or fluid cream for local consumption. The licensing and inspection also extend to all processors or retailers handling food in the city. It is only at the retail level that such inspection affects such products as butter and cheese or condensed milk. Local controls do not include price fixing although the administration of these may affect supply and through it the price. The standards set for whole milk production are an example of this.

Provincial controls over dairy products are of two types. The first type is the direct controls exercised over creameries, cheese factories, and condensing plants. These plants must receive a licence to operate, from the Minister of Agriculture. They are inspected regularly and if found unsanitary or guilty of discriminating against certain producers the licence may be revoked. In practice, the inspector's function is largely educational, affecting production mainly through improved quality of product and the improved markets which that may bring.

In the case of whole milk and inspected cream the provincial controls are mainly concerned with the price. The control of whole milk prices began in Alberta in 1933 when the organized whole milk shippers made application for legislation that would stabilize the industry. Following these representations the Public Utilities Act was amended, placing the control of the production and distribution of milk under the jurisdiction of the Board of Public Utility Commissioners. The Board operates through a milk control office where all whole milk and inspected cream producers and vendors must obtain a licence. Infractions of Board orders can be punished by cancelling the licence of the offender. Usually such drastic action is unnecessary. In general terms, the Board is responsible for seeing that fair treatment is accorded the consumers, the producers, and the distributors. They are given power to set prices and regulate practices in order to make their control effective.

Dominion Government controls over dairy production before the war concerned mainly products that enter into international trade, such as butter, cheese, and condensed milk. At first the Dominion controls were largely confined to licensing exporters and grading the finished product to facilitate the movement into export. In 1939, in order to further improve the quality of cheese produced in Canada, a bonus was paid on high grade cheese. The bonus was two cents per pound on 94 score cheese and one cent for 93 score cheese. This measure meant less to Alberta cheese producers than to those in Ontario, since much of the Alberta product is sold locally and ungraded.

TABLE 7.—SUBSIDIES PAYABLE ON DAIRY PRODUCTS¹

Subsidy period	Rate of subsidy	Paid under direction of	Comments
Fluid Milk:—			
Dec. 22/41–Apr. 30/42.....	30c. per 100 lb.	WPTB ³	Payable in areas where no price increase had taken place since August 1941.
Sept. 1/42–Apr. 30/43.....	25c. per 100 lb.	WPTB	In areas specified by WPTB and dependent on fixed minimum producer prices paid by distributors. ²
May 1/43–Sept. 30/43.....	25c. per 100 lb.	AFB ⁴	In areas specified by AFB.
Oct. 1/43–Apr. 30/44.....	25c. per 100 lb., or 55c. per 100 lb.	AFB	In areas specified by AFB.
May 1/44–Sept. 30/44.....	25c. per 100 lb., or 35c. per 100 lb.	AFB	In areas specified by AFB.
Oct. 1/44–Apr. 30/45.....	25c. per 100 lb., or 55c. per 100 lb.	AFB	In areas specified by AFB.
Creamery Butter:—			
July 6/42–Dec. 20/42.....	3c. per lb. bf.	WPTB	
Dec. 21/42–Apr. 30/43.....	10c. per lb. bf.	WPTB	Seasonal increase in wholesale prices cancelled.
May 1/43–Dec. 31/43.....	3c. per lb. bf.	AFB	If creamery butter used for industrial purposes the subsidy is to be refunded to the Government.
Jan. 1/44–Apr. 30/44.....	10c. per lb. bf.	AFB	
May 1/44–Apr. 30/45.....	10c. per lb. bf.	AFB	
Cheddar Cheese:—			
Oct. 1/43–Apr. 30/44.....	30c. per 100 lb. of milk	AFB	In addition Dominion bonuses are paid on high quality cheese.
May 1/44–Apr. 30/45.....	20c. per 100 lb. of milk	AFB	Ontario and Quebec also pay provincial bonuses.
Concentrated Milk Products:—			
Dec. 22/41–Apr. 30/42.....	40c. per 100 lb. of milk	WPTB	
Mar. 1/43–Apr. 30/43.....	25c. per 100 lb. of milk	AFB	On milk used in manufacture of whole milk products.
Oct. 1/43–Apr. 30/44.....	30c. per 100 lb. of milk	AFB	On milk used in the manufacture of whole milk products, and skim milk products provided no other subsidy has been paid on milk.
May 1/44–Sept. 30/44.....	15c. per 100 lb. of milk	AFB	
Oct. 7/44–Apr. 30/45.....	30c. per 100 lb. of milk	AFB	

¹ The Economic Annalist, p. 54. Economics Division, Marketing Service, Department of Agriculture, Ottawa, Canada. August, 1944.

² Consumer subsidy of 2 cents per quart was announced in December, 1942, which meant a reduction in price of 2 cents per quart on all fluid milk sold to consumers either at retail or wholesale. This subsidy does not mean an increase to producers but is paid under authority of the Wartime Prices and Trade Board.

³ Wartime Prices and Trade Board.

⁴ Agricultural Food Board.

When war began in 1939 the Dominion Government assumed the responsibility for supplying definite quantities of food to Britain as well as control over retail prices at the ceiling level. The result has been some direct orders affecting the dairy industry such as the order requiring a permit to carry processed milk or cream in commercial trucks. This was designed to avoid duplication of routes and save gasoline and tires.

The main controls exercised, however, have been through bonuses paid for specified products. These bonuses or subsidies are given in Table 7. In the beginning the subsidies shown were paid as a means of getting a higher price to the producer without a corresponding increase in cost to the consumer. The emphasis has shifted slightly to include control over the type of production desired through the subsidizing of products wanted. There is also some tendency to shift towards control of farm income, as is evidenced by such things as the floor price set for butter and the approach to floor prices for all agricultural products.

The Study

SAMPLING PROCEDURE.—The size of sample that could be handled was limited by the size of the staff available. It was estimated that three fieldmen could supervise about 200 farms and that a sample of 50 farms each for whole milk, inspected cream, churning cream, and cheese farms in the area would be desirable. Therefore in the beginning the study was confined to the Edmonton district.¹ In the first year records were completed on 47 whole milk farms, 51 inspected cream farms, 108 churning cream farms, and 30 cheese milk farms. This gave a 28 per cent sample of the Edmonton whole milk shippers and over 50 per cent of the inspected cream shippers. The sample in cheese producing districts was reduced by a cheese factory becoming a creamery during the account year and most of its patrons becoming cream producers. The areas chosen for the study were selected for their position in the main dairy production zones of Alberta. The farms producing whole milk for human consumption are located near the market they serve.

In this study precautions were used in selecting a representative sample. In the first place only farms that had four or more cows milking, that shipped to the type of market to be sampled, and on which all or most of the income came from the farm, were included. The dairymen were separated for purposes of analysis according to the market to which they shipped. In addition to figures on size of farms, crop acreages, livestock kept, and sources of income to be found in the Census, figures were available from the Alberta Milk Control office on the average daily shipments and quotas of all whole milk and inspected cream shippers. In the beginning it was found that there was a slight tendency to approach the operators with larger herds. Later more of the smaller shippers were selected to offset this. It was interesting to note that the average price received by whole milk shippers who kept account books was within a fraction of a cent of the price paid in the Edmonton area to shippers, as compiled from the records of the distributing plants by the Milk Control office of the Board of Public Utility Commissioners.

There were several groups of dairymen included in the study. Thus another precaution was used in securing an adequate sample by noting whether any characteristics recurred in other groups of Alberta dairy farms. Since the study was carried on for four years, one year's results could be checked against those of any other year or group. The actual number of farms studied by groups and years are given in Table 8.

¹ In the fourth year of the study the number of farms visited in the Edmonton area was reduced in order to permit the inclusion of other dairy groups.

TABLE 8.—THE NUMBER OF FARMS COMPLETING ANNUAL ACCOUNTS IN THE ALBERTA DAIRY STUDY BY MARKET GROUPS AND YEARS

Market	1939-40	1940-41	1941-24	1942-43
	No.	No.	No.	No.
Edmonton Whole Milk.....	47	45	42	15
Edmonton Inspected Cream.....	51	49	43	12
Churning Cream.....	108	85	72	30
Northern Cheese Milk.....	30	25	20	.....
Lethbridge Whole Milk.....	.....	.....	8	7
Calgary Whole Milk.....	.....	.....	35	31
Calgary Inspected Cream.....	.....	.....	12	6
Coaldale Cheese Milk.....	.....	.....	21	.....
Rosemary Cheese Milk.....	.....	.....	29	.....
Condensery (Red Deer).....	.....	.....	.....	49

SECURING THE DATA.—The method of securing data was to supply dairy farm cost account books to a selected group of representative dairymen. Assistance was given in keeping the records up to date during two or three calls at the farm each year. The account book covered all farm business operations, and space was also provided to segregate all items chargeable to the dairy enterprise.

When calculating the costs for the dairy enterprise the entire dairy herd was treated as a unit. Where beef enterprises were handled in separate pastures and in separate barns, these cattle were not included in the dairy herd. The cost as shown is for milk or cream delivered to the processing plant and includes the cost of hauling either by commercial trucker or by the farm operator. Labour on dairy chores was charged at prevailing rates for hired labour, with board included. Feed was charged to the dairy at its market value ¹.

ANALYSIS OF THE DATA.—*Costs of Milk or Cream Production.*—The general measure used in presenting costs of dairy production is the cost per pound of butterfat, and in the case of whole milk this can, by multiplication, readily be converted to the equivalent of 100 pounds of whole milk at the standard 3.6 test. The cost per pound of butterfat is the net cost of milk production, or the total cost minus the credits to the dairy, divided by the total pounds of butterfat sold or used in the house. The credits include herd increase, skim-milk, and prize money.

Measures of Success.—The success of a farm operator, in a given year, depends on the amount that receipts exceed expenses. Since there are different kinds of receipts and expenses an explanation of those calculated may be desirable. Cash receipts are added to increases in inventory values to calculate the total farm receipts for the year. Each class of capital, such as buildings, land, live-stock, or feed and supplies, was dealt with separately so that there could be both increases of inventory and decreases on the same farm. Changes in values

¹ The argument is sometimes advanced that feed should be charged at its cost of production and not at market price because it is said the feed is grown for the dairy and not for sale. In an area where part of the feed has to be purchased, it is obvious that growing the feed is an alternative to buying more. In cases where a surplus of feed is grown it is equally obvious that feeding part of the production to cows is merely an alternative to selling it all. Even where the feed produced is adjusted to the animal requirements, it is by no means certain that the feed is produced for the dairy. For example, one co-operator who grows very clean grain frequently gets attractive offers for part of his crop to be used as seed. When this occurs, he sells his own grain and buys back cheaper grain for feed. Even if a dairyman lives in an area where ready sales are not always obtained, he is not bound to feed what he produces to his dairy cows. For example, one co-operator decided that dairy prices were not sufficiently attractive, so he sold his herd of thirteen cows and purchased young feeder cattle and used his dairy barn and feed to produce beef. The dairy enterprise must be prepared to compete for feed with all these alternatives or it may not continue. Hence, the use of the market or alternative opportunity price as a basis of costs.

of breeding stock or real estate and machines were not included in inventory increases during the account year except for physical appreciation or depreciation. This was done in order to avoid the book increases appearing in the accounts as annual income, when the probability was that the operator would never realize any cash income or loss from the changed valuations.

Total farm expenses are the sum of current expense, capital purchases, and inventory decreases. Current expense includes labour hired, or family labour other than the operator, repairs, and all material used up or likely to be used up during the current year. The capital purchases and improvements include new purchases which will last over a period of years and therefore must be treated as an addition to capital, that is, the purchase of a machine or building will be offset by an increase of inventory which will appear in the farm receipts.

Farm receipts less farm expenses equal farm income. The farm income is what the operator has left for the use of his capital, labour and management from one year's operations. To take the capital out of the picture a deduction is made for the use of capital at 5 per cent of its value. The result is called labour income. The labour income plus the use of the house and the value of farm products used in the house equals operator's labour earnings. This is the measure of success mainly used in this study.

PRESENTATION OF RESULTS.—It has been possible to present only one year's results for some market groups of dairymen. In other groups the most representative year is presented.

PART I

THE WHOLE MILK AND INSPECTED CREAM SHIPPERS

Description of Farms

TOTAL ACRES PER FARM.—The total acres per farm, by area and by class of shipper, are shown in Table 9. Inspected cream farms tend to be larger

TABLE 9.—AVERAGE ACREAGES OF ALBERTA DAIRY FARMS, 1941-42

	Edmonton Area	Calgary Area	Lethbridge (Irrigated) Area
	Ac.	Ac.	Ac.
Total Acres:—			
Whole milk farms.....	336	520	351
Inspected cream farms.....	410	662	.....
Crop Acres:—			
Whole milk farms.....	218	257	285
Inspected cream farms.....	285	288	.....
Adjusted Acres:—			
Whole milk farms.....	267	348	336
Inspected cream farms.....	311	398	.....

than other types of farms. This is probably the result of the selection of farms. Inspected cream farms can be selected from a much larger area than whole milk farms, as a concentrated product like cream can be shipped much farther than whole milk. Furthermore cream does not need to be delivered every day so roads are a lesser consideration. The Departments of Public Health tend to select those farms which are best able to meet requirements, such as up-to-date

milk houses and whitewashed barns. These requirements can be more easily met on the larger farms and consequently they tend to be selected as inspected cream shippers.

Total acres per farm averaged more than a half section of land in all three areas, but exceeded three-quarters of a section only in the Calgary area.

CROP ACRES.—The acres of crop land are also given in Table 9. Crop acres per farm vary much less than total acres, which indicates that the biggest variation in the total acres comes from the rolling uncultivated land of the Calgary area. Table 9 shows that the Lethbridge area had very little more crop land per farm than the other two areas. However, because of the relatively high production per acre, the Lethbridge whole milk farms have much larger businesses. The crop land at Lethbridge is mostly irrigated and grows some very intensive crops like sugar beets and canning peas. Furthermore, the alfalfa grown at Lethbridge averaged twice as high in yield per acre as that of the Edmonton or Calgary areas. Differences in grain yields between the areas are not so marked.

ADJUSTED ACRES.—On livestock and mixed farms the productive capacity of the farm depends on the numbers of livestock kept. The capacity to support livestock depends on the uncultivated land as well as on the crop land. An adjustment to allow for the capacity of the uncultivated land was made by adding to the crop land the seeded pasture acreage, one-third of the rough open pasture acres, and one-tenth of the pasture covered with bush. The total result is called the adjusted acreage. This is a measure which is referred to as the "adjusted acres". As in the case of crop acres, allowance must still be made for the difference between irrigated land and dry land, and between different classes of dry land. However, the measure of adjusted acres provides a basis for comparing the stock carrying capacities of dairy farms and is particularly useful for making a comparison of size of farms in the same area.

ANIMAL UNITS.—The majority of farms have two or more classes of livestock and therefore, to compare the livestock on different farms, a common unit is needed. The unit used is called an Animal Unit, and the number of units is arrived at by a comparison of the feed requirements of different classes of stock. The assumed feed requirements of one cow through one year is the basis of one animal unit. Approximately the same feed, measured in total digestible nutrients, is required to raise five hogs to market weight, to keep seven sheep through a year, or to feed fourteen lambs to market weight. In arriving at the animal units for feeder stock, adjustments are made for the time they are kept and for the intensity of feeding. The animal units represented by young stock are also computed on the basis of feed requirements. In this way all classes of livestock can be combined in order to compare the relative importance of livestock on farms, and to provide a measure of livestock carrying capacity.

Table 10 shows the average animal units by classes of animals for the three main milk sheds. The year 1941-42 was chosen, as that was the only year in which a large sample was maintained in each of the three areas. It will be noticed that the average number of animal units was largest in the Lethbridge area. The number of swine per farm was largest on the inspected cream farms in the Edmonton area. On the whole milk farms the livestock are predominantly dairy cattle, whereas on the inspected cream farms the dairy herd accounted for less than half of the total animal units.

TABLE 10.—AVERAGE PRODUCTIVE ANIMAL UNITS PER FARM, 1941-42

	Edmonton Area		Calgary Area		Lethbridge Area
	Whole milk farms	Inspected cream farms	Whole milk farms	Inspected cream farms	Whole milk farms
	A.U.	A.U.	A.U.	A.U.	A.U.
Dairy cattle.....	27.8	25.0	43.4	22.9	58.3
Beef cattle.....	.1	1.8	2.1	26.4	9.6
Sheep.....		.2	.2		
Swine.....	9.6	18.2	5.1	13.0	8.9
Poultry.....	1.4	1.8	1.2	.7	.3
Total animal units ¹	46.6	56.6	57.1	73.0	85.6

¹ The difference between total animal units and the averages shown is due to horses which are kept for work, as distinct from "productive animal units" or animal units kept only for the income obtained from them.

Financial Summary

In Table 11 is presented a summary of the findings in the three main milk sheds. Labour earnings tended to increase over the period of the study. However, the variation between the highest and lowest earnings in the same group during the 1941-42 account year was greater than the variation in average earnings between any two years or groups. The causes of this variation are discussed in detail in subsequent sections.

TABLE 11.—FINANCIAL SUMMARY

	Edmonton Area		Calgary Area		Lethbridge Area
	Whole milk farms	Inspected cream farms	Whole milk farms	Inspected cream farms	Whole milk farms
	\$	\$	\$	\$	\$
Labour Earnings:—					
Averages: 1939-40.....	874	91			
1940-41.....	1,288	772			
1941-42.....	1,165	1,194	2,408	1,123	984
1942-43.....	2,275	1,804	2,671	525	4,692
Highest labour earnings, 1941-42.....	3,756	4,397	6,604	3,374	3,309
Lowest labour earnings, 1941-42.....	-701	-1,192	-718	-1,090	-3,370
Cost per Pound Butterfat:—					
Averages: 1939-40.....	.49	.43			
1940-41.....	.47	.37			
1941-42.....	.59	.43	.50	.53	.59
1942-43.....	.68	.62	.64	.59	.57
Highest cost per pound butterfat, 1941-42.....	.96	.76	.92	.83	.77
Lowest cost per pound butterfat, 1941-42.....	.41	.18	.34	.31	.43
Dairy Returns per Hour of Labour:—					
Averages: 1941-42.....	.33	.22	.43	.15	.25
1942-43.....	.45	.17	.50	.18	.72
Highest returns per hour, 1941-42.....	.71	.50	.95	.53	.56
Lowest returns per hour, 1941-42.....	.10	.00	-.08	-.12	.02

The average production cost per pound of butterfat was lower in 1940-41 than in the previous year but rose steadily during the next two years. During the 1940-41 account year conditions in the Edmonton area were unusually

favourable to dairying. A moist summer provided good pastures until late in the fall, and a generally good crop supplied an abundance of winter feed. The increase in cost per pound of butterfat since that time is due to poorer crops of feed and to increasing feed prices and wages of labour.

Feed and labour make up from 70 to 80 per cent of the total costs so that most of the variation in dairy costs per pound of butterfat must come from these two items or from the amount of butterfat produced. This latter is shown in tables presented later.

The returns per hour of labour were calculated by subtracting from the dairy receipts all costs to the dairy except labour. The net returns then were divided by hours of dairy chores to get the return per hour of labour. With this method of calculation, nearly all the dairy enterprises did return something for the time expended on them, though in some cases this was less than the equivalent of the prevailing wage for hired help.

The highest rate per hour earned on whole milk farms, 1942-43, namely \$1.54 per hour, was the equivalent of \$400 for wages and board per month. The highest returns per hour of labour on inspected cream farms was the equivalent of \$138 per month for wages and board. The returns per hour of labour varied all the way from these high rates to a loss beyond labour expended.

Variations in Results

The prices paid for farm products are an important cause of variation in results obtained in different years and in different types of market. However, the widest variation in results obtained by farm operators frequently comes in the same year and in the same market group. This latter type of variation is due to the organization and management of the individual farms. Variation due to price is a group problem. The individual farm operator can do very little about it except where price is affected by quality of products. Variation due to organization and management can only be controlled by the individual farm operator. The wide variation in results obtained indicates the importance of knowing the causes of this variation. In the majority of cases knowing the causes of variation will help to indicate the methods that must be used to obtain higher earnings.

Higher net earnings may be obtained by an increase in receipts or a decrease in expenses, or both. Farm receipts must come from the sale of livestock and their products or from crops. Farm expenses all represent an outlay of labour or of capital ¹.

Size of business operates through receipts and expenses on livestock, crops, labour and capital which comprise the major sources of receipts and expenses on a farm. However size has some characteristics that can be explained more adequately if treated as a separate factor. The combination of enterprises is similar to size in that its effect on labour earnings must be registered through livestock, crops, labour or capital. This factor, is also discussed separately in order to consider all the applications of the principles involved. In presenting the analysis of the data, efficiency in the use of: (1) livestock; (2) crops; (3) labour; (4) capital, is related to labour earnings and the cost per pound of butterfat. This is followed by a discussion of (5) size of business; and (6) combination of enterprises.

¹ Capital in this case includes both current capital to meet day to day expenses and the carrying charges on longer time investment such as land and machinery.

Livestock

PRODUCTION PER COW.—On specialized dairy farms one of the most important indications of efficiency with livestock is the butterfat produced per cow. The relation of production per cow to labour earnings feed, costs and rations in the 1941-42 account year is shown in Table 12. The farms in the groups with highest producing cows had the highest labour earnings and while feed cost per cow also increased it did not increase in proportion to the increase in production per cow.

TABLE 12.—RELATION OF PRODUCTION PER COW TO FEEDS FED, 1941-42.
(Whole Milk and Inspected Cream Shippers)

Butterfat per Cow	Number of farms	Average labour earnings	Concentrates per animal unit	Roughage per animal unit	Acres of Adjusted pasture per cow	Cost of feed per dairy animal unit	Milk receipts per cow	Margin over feed cost
Lb.	No.	\$	Lb.	T.	Ac.	\$	\$	\$
Less than 220.....	27	1,014	1,756	2.31	2.6	42	100	58
220 to 259.....	28	1,159	1,933	2.34	2.7	47	119	72
260 to 299.....	44	1,655	2,312	2.38	2.9	52	151	99
300 to 339.....	28	1,701	3,073	3.14	2.1	64	177	113
340 or more.....	13	1,932	3,068	3.09	2.8	64	219	155

Even on the specialized dairy farms the butterfat per cow is not an entirely satisfactory measure of efficiency with livestock. The cost of the feed used is an important consideration. Table 13 gives the variation in returns per \$100 worth of feed fed to the dairy herd and its effect on labour earnings and cost per pound of butterfat. Feed represents about 43 per cent of the cost of whole milk production in Alberta, so that it is to be expected that efficiency in the use of feed would be closely related to cost per pound of butterfat as indicated in Table 14. The returns per \$100 worth of feed in any one year and in one market group are affected by the rate of production per cow, the local prices of feeds, and the types of feed fed.

TABLE 13.—THE EFFECT OF FEEDING EFFICIENCY AS MEASURED BY RETURNS PER \$100 WORTH OF FEED FED TO THE DAIRY HERD, 1941-42

Returns per \$100 worth feed fed to dairy herd	Number of farms	Average labour earnings	Cost per pound of butterfat	Concentrates fed per dairy animal unit	Roughage fed per dairy animal unit	Acres of adjusted pasture per animal unit	Returns per animal unit in dairy
\$	No.	\$	c.	Lb.	T.	Ac.	\$
Less than:—							
180.....	31	804	66.6	2,952	2.95	2.4	99
180 to 219.....	29	1,293	56.5	2,704	2.81	2.6	110
220 to 259.....	36	2,002	48.8	2,093	2.63	2.4	116
260 or more.....	44	1,611	46.1	2,140	2.32	3.0	137

GRAIN FED.—Perhaps the greatest variation in types of feed fed is in the amount of concentrates or grain fed. The effect of the rate of concentrate feeding to dairy herds is shown in Table 14.

TABLE 14.—THE EFFECT OF THE AMOUNT OF CONCENTRATES FED TO THE DAIRY HERD, 1941-42

Pounds of concentrates fed per animal unit	Number of farms	Average labour earnings	Average cost per pound butterfat	Feed cost per cow	Concentrates per dairy animal unit	Roughage per animal unit	Butterfat sold per cow
Lb.	No.	\$	¢	\$	Lb.	T.	Lb.
Edmonton Whole Milk Shippers:—							
Less than 2,000.....	13	845	53.4	62	1,334	3.06	250
2,000 to 2,999.....	15	1,305	66.4	84	2,567	2.76	256
3,000 or more.....	14	1,255	64.4	102	4,089	3.08	306
Edmonton Inspected Cream Shippers:—							
Less than 1,200.....	8	464	39.3	45	944	1.83	188
1,200 to 1,899.....	16	1,245	41.5	56	1,498	2.29	223
1,900 or more.....	19	1,460	45.3	74	2,586	2.19	250
Calgary Whole Milk Shippers:—							
Less than 2,000.....	18	2,244	45.9	58	1,560	2.13	232
2,000 or more.....	17	2,572	53.3	85	3,076	2.91	272

As the rate of feeding rose, the butterfat sold per cow increased steadily but not in proportion to increase in feed cost per cow, which resulted in a higher cost per pound of butterfat. This relationship would depend to some extent on the relative prices and quality of roughage and grain, but as grain prices in the 1941 crop year were below the long-time average the results as shown are likely to be representative in the majority of years. An exception occurred in 1939-40 when a higher rate of grain feeding in the Edmonton area resulted in lower costs per pound of butterfat.

The quantities of roughage fed per animal unit vary much less than the quantities of concentrates fed. Comparisons based on quantities of roughage fed in the barn showed no distinct relation to labour earnings, to cost per pound of butterfat, nor to pounds of butterfat produced per cow. The quantities picked up outside, as pasture or stacked dry roughage, no doubt tend to offset the variations in quantities fed in the barn.

PASTURE.—The quantity of pasture available depends so much on rainfall that a farm operator's estimate of the pasture acreage required must be based on his experience over a period of years. This results in considerably different quantities being available per animal unit in moist summers when compared with pasturage available in dry summers. In 1941-42 including the late summer and fall of 1941 which were considered to be very dry in most of the dairy areas of Alberta, the acres of adjusted pasture available per animal unit had an important effect on the cost per pound of butterfat. This is shown in Table 15.

TABLE 15.—THE EFFECT OF PASTURE AVAILABLE PER COW, 1941-42.

Acres of adjusted pasture per animal unit	Number of farms	Average labour earnings	Cost per pound of butterfat	Animal units of cows per farm	Value of feed fed per unit of dairy stock	Average butterfat sold per cow	Feed cost per pound of butterfat
	No.	\$	¢	A.U.	\$	Lb.	¢
Edmonton Whole Milk Shippers:—							
Less than 3.....	23	1,038	65.8	21.8	64	265	31.7
3 or more.....	19	1,277	58.3	19.4	61	280	30.3
Edmonton Inspected Cream Shippers:—							
Less than 3.....	23	1,195	43.3	18.6	42	234	25.6
3 or more.....	20	1,194	41.6	15.0	38	214	27.9
Calgary Whole Milk Shippers:—							
Less than 3.....	17	2,315	50.6	31.5	55	239	30.1
3 or more.....	18	2,490	49.5	30.6	51	265	26.9

Where pasture is plentiful it provides nutrients at lower cost than almost any kind of hand feeding. Where pasture is scarce, reduced production per cow can be prevented only by the use of expensive feeds. There is also a considerable saving in labour when cows are out on pasture.

LIVESTOCK INDEX.—While on the average, revenue from the dairy enterprise represented 68 per cent of the total farm income in the Calgary whole milk group, it accounted for only 30 per cent of the gross income in the Edmonton inspected cream shipping group. Since the success or failure on many farms would be affected more by efficiency with other stock than by the dairy, it was desirable to have a measure of efficiency with livestock that would include all livestock. For this purpose the measure called Livestock Index was used. Livestock Index¹ expresses the rate of return per animal unit as a percentage of average with the average taken as 100. For example, a livestock index of 120 would mean a farm receiving 20 per cent more earnings per animal than the average of the group of farms to which it belonged.

¹ The Livestock Index is arrived at by the following steps:—

- (1) Calculate the animal units for each farm.
- (2) Calculate the returns for each class of stock for each farm.
- (3) Determine the animal units for each class of stock, by market groups.
- (4) Determine the total returns for each class of stock, by market groups.
- (5) Determine the average returns for each class of stock, by market groups (excluding horses which are kept for work).
- (6) Divide each operator's livestock returns by the average returns as determined in (5). This indicates the number of animal units he would require, *with average returns* to obtain the returns he secured from each class of stock (excluding horses which are kept for work rather than income produced).
- (7) Divide the actual number of animal units on each farm (excluding horses), into the sum of the animal units of each class as determined in (6) and multiply by 100. This gives an index of returns per animal unit for each farm of which the average for each market group will be 100.

In Table 16 is presented the effect of efficiency with all livestock as measured by livestock index.

TABLE 16.—EFFICIENCY WITH ALL LIVESTOCK AS MEASURED BY LIVESTOCK INDEX, 1941-42.

Livestock Index	Number of farms	Average labour earnings	Cost per pound butterfat	Percentage receipts from crops	Cash receipts per man	Hours of dairy chores per pound butterfat
%	No.	\$	¢	%	\$	Hr.
Edmonton Whole Milk Shippers:—						
Less than 100.....	25	988	65	5	2,142	.8
100 or more.....	17	1,379	60	4	2,443	.6
Edmonton Inspected Cream Shippers:..						
Less than 100.....	25	818	46	9	2,745	1.0
100 or more.....	18	1,717	39	7	1,820	.9
Calgary Whole Milk Shippers:—						
Less than 100.....	15	1,465	55	6	2,531	.8
100 or more.....	20	3,110	47	5	2,789	.6

It will be observed that the livestock index has a marked relationship to labour earnings and cost per pound of butterfat produced. It will also be observed that there is some relation between livestock index and labour efficiency, as measured by the cash receipts per man, or by hours of dairy chores per pound of butterfat. This latter labour efficiency and volume of production will be discussed later. The cream producers require more time to produce a pound of

butterfat because they have to separate the milk and wash the separator. They also have fewer milking machines because they have smaller herds.

Crops

AVERAGE YIELDS.—Crops are important whether they are raised for sale or for feed. Without plant growth there could be no livestock. Thus, even though crops may be raised for feed, their efficiency of production is important. The usual method of appraising the efficiency in crop production is by yield per acre of crop land. In Table 17 is given the average yield per acre of some of the more important crops found on farms co-operating in the study.

TABLE 17.—AVERAGE YIELDS OF IMPORTANT CROPS BY DISTRICTS AND YEARS.

Crop Year	District	Oats	Wheat	Barley	Green Feed (bundles)	Alfalfa
		Bu.	Bu.	Bu.	T.	T.
1939-40	Edmonton.....	34.2	21.6	22.9	.69	2.14
1940-41	Edmonton.....	43.7	27.6	29.1	1.40	1.50
1941-42	Edmonton.....	26.8	24.2	18.2	.94	1.30
	Calgary.....	35.4	22.1	25.8	1.05	1.30
	Irrigated land.....	44.3	24.7	27.1	2.40	3.00
1942-43	All dry land.....	44.2	28.2	27.5	1.55	1.97
	Irrigated land.....	52.9	26.9	44.9	4.22	2.79

It will be seen that average yields vary considerably by seasons and by districts. For example, one should not expect crops on dry land to yield as well as where moisture is controlled by irrigation. On the other hand the operator of irrigated land has more equipment and heavier expenses than the dry land farm operator has. On dry land the yield varies considerably according to the soil and season. Therefore, the correct comparison is with similar farms in the same district, in the same year. This can be done with a crop index.

CROP INDEX.—Crop index ¹ expresses the yields per acre on a given farm as a *percentage of average*, with the average taken as 100. For example, a crop index of 120 would mean that a farm had yields of 20 per cent above the average of the area chosen as a unit.

When the farms were sorted according to their crop index, the result was as shown in Table 18. It will be seen that as crop yield index increased in each market group, the labour earnings also increased markedly. As crop yield index increased, it will also be seen that both average crop acres and crop acres as a percentage of total acres decreased. These relations have been found in all groups.

¹ The steps in calculating crop index are:—

- (1) Calculate the acres of each type of crop for each farm.
- (2) Calculate the total yield of each type of crop for each farm.
- (3) Determine the total acres of each type of crop, by market groups.
- (4) Determine the total yields of each type of crop, by chosen areas.
- (5) Determine the average yields for each type of crop, by area.
- (6) Divide each operator's total yield by the average yields as determined in (5). This indicates the number of acres he would require *with average yields* to obtain the total yields he secured from each type of crop.
- (7) Divide the actual number of cropped acres on each farm into the sum of the acres as determined in (6) and multiply by 100. This gives an index of crop yields per acre for each farm of which the average for each area chosen will be 100.

TABLE 18.—THE EFFECT OF CROP YIELDS AS MEASURED BY CROP INDEX, 1941-42.

Crop Index	Number of farms	average labour earnings	Crop acres as percentage of total acres	Crop index	Average crop acres
	No.	\$	%	%	Ac.
Edmonton Whole Milk Shippers:—					
Less than 110.....	19	1,080	66	88	274
110 or more.....	23	1,201	63	132	171
Edmonton Inspected Cream Shippers:—					
Less than 110.....	21	936	71	85	336
110 or more.....	22	1,442	65	130	229
Calgary Whole Milk Shippers:—					
Less than 90.....	18	1,882	53	72	284
90 or more.....	17	2,959	46	125	228

Before trying to explain this relationship, it is advisable to consider the use of the land that is not in crop. This is shown in Table 19.

TABLE 19.—USE OF LAND NOT CROPPED, 1941-42

Cows per Farm	Number of farms	Crop land	Seeded pasture	Open (wild) pasture	Woods pastured	Woods not pastured	Yards, Roads and fences	Total acres
Number	No.	Ac.	Ac.	Ac.	Ac.	Ac.	Ac.	Ac.
Edmonton Whole Milk Shippers:—								
Less than 15.....	13	150	22	12	1	1	6	204
15 to 19.....	14	170	25	50	26	9	7	287
20 to 24.....	6	238	36	66	23	37	6	406
25 or more.....	9	376	53	42	63	9	12	55
Edmonton Inspected Cream Shippers:—								
Less than 15.....	18	222	20	25	23	5	6	301
15 to 19.....	11	313	32	54	16	3	7	425
20 or more.....	14	347	20	100	56	10	6	539
Calgary Whole Milk Shippers:—								
Less than 20.....	11	137	5	97	12	2	3	256
20 to 29.....	6	269	10	117	38	4	7	445
30 to 39.....	9	374	21	299	20	.....	6	720
40 or mote.....	9	279	38	329	26	11	8	691

It will be seen that seeded and open uncultivated pasture represents a considerable area of land that could be tilled. The usual practice is to leave or seed the least desirable land for pasture. This suggests that one reason why some farm operators obtain higher crop yields is that they may select their crop land more carefully and use the poorer land for pasture. Another related factor would be that having more pasture and animals to utilize it, they would need more soil improving crops for winter feed and would have more manure for the land.

Weather conditions have a marked effect as between districts. This was indicated in the area from Calgary to Edmonton by the 1942-43 crop indexes which were based on all the farms on dry land in the study.

Using the provincial average as 100 the average indexes were for the Edmonton whole milk district 111, for the Red Deer condensery area 96, and for the Calgary whole milk area 117. This was a very good crop year in the Calgary area with normal crops in the other areas. However, the variation between individual farms ran all the way from an index of 50 to an index of 169 in the

Calgary whole milk area alone. The effect of good crop yields on labour earnings was more marked during the 1942-43 year, when prices for livestock fed on grain were higher than in 1939-40.

Labour

LABOUR REQUIRED PER FARM.—In order to appraise the amounts of the various types of labour, that is, day, month, and year labour, these were reduced to a common measure—the man equivalent. A full year's labour performed by one man was termed a Man Equivalent; or, stated in another way, the man equivalent was determined by dividing the total number of months of labour on each farm for the account year, (including operator's time) by twelve.

The total labour used as measured by the man equivalent has shown some decline during the war years as is indicated in Table 20 based on the labour used on Edmonton district farms.

TABLE 20.—LABOUR USED ON EDMONTON DISTRICT DAIRY FARMS, ACCORDING TO TYPE OF PRODUCER AND SIZE OF FARM¹

	Total Acres	Num- ber of farms	Man equiv- alent per farm ²	Months hired per farm	Days of day labour per farm	Months unpaid family labour per farm ³	live stock units per man ⁴	Crop acres per man
—	Ac.	No.		Mo.	Days	Mo.	No.	Ac.
Whole Milk Shippers:—								
1939-40.....	Under 300	25	2.3	11.5	21	4.4	14.9	50.2
	300-399	15	2.5	14.4	16	4.9	15.5	77.1
	400 or more	7	4.0	33.8	42	2.1	20.0	126.6
1940-41.....	Under 300	23	2.2	7.7	6	6.9	15.0	53.8
	300-399	11	2.6	8.6	14	10.4	13.5	77.4
	400 or more.	11	3.5	23.7	41	5.8	19.9	123.5
1941-42.....	Under 300	21	1.9	4.1	24	6.8	5	5
	300-399	13	2.4	8.7	45	7.0	5	5
	400 or more	9	3.7	25.2	40	5.7	5	5
Inspected Cream Shippers:								
1939-40.....	Under 300	12	2.2	6.9	41	7.9	14.2	46.6
	300-399	16	3.1	10.2	26	15.3	12.9	71.6
	400 or more	23	3.8	11.0	58	22.0	17.8	114.2
1940-41.....	Under 300	10	2.1	5.4	50	6.6	16.2	51.1
	300-399	19	2.8	11.0	49	12.9	16.8	81.6
	400 or more	20	3.9	11.4	93	20.3	18.5	112.3
1941-42.....	Under 300	12	2.2	6.3	30	7.5	5	5
	300-399	14	2.7	6.8	56	11.2	5	5
	400 or more	15	3.6	7.2	46	22.6	5	5

¹ Patterson, H. L. and B. H. Kristjanson. Alberta Dairy Farmers' Labour Problems. The Economic Annalist. May, 1943.

² Includes operators' time.

³ Other than operator.

⁴ Horses not included.

⁵ Not available at present.

Farms vary greatly in the manner in which work is performed. The result is a large variation in the number of acres or animals that one man can look after. This variation is not so much due to how hard a man works as to the methods used to perform the work, and to the facilities available. The highest output per man is usually found where the operator spends considerable of his time in planning the details of his farm business including the easiest ways of getting work done.

MEASURES OF EFFICIENCY.—There are many ways by which efficiency in the use of labour may be measured. In the case of specialized dairy farms the number of cows per man may be used. The herd average production per cow varied all the way from 125 pounds of butterfat to 454 pounds of butterfat per cow. Since this increase of production would involve some extra care in the form of more inside feeding and caring for the animals, the number of cows alone does not fully measure the accomplishments of labour in the dairy.

A measure which does take intensity of production into account, is the hours of chores required per pound of butterfat produced. The effect of labour efficiency in the dairy as measured by hours of chores per pound of butterfat is indicated in Table 21. It will be seen that the hours of chores per pound of butterfat bore a very close relation to cost per pound of butterfat, and also a reasonably marked relation to the operator's labour earnings.

TABLE 21.—THE EFFECT OF LABOUR EFFICIENCY AS MEASURED BY HOURS OF DAIRY CHORES PER POUND OF BUTTERFAT PRODUCED, 1941-42.

Hours of Dairy Chores per pound of Butterfat produced	Number of farms	Average labour earnings	Cost per pound butterfat	Average hours per pound butterfat	Cash receipts per man
Hours	No.	\$	¢	Hr.	\$
Edmonton Whole Milk Shippers:—					
Less than .8 hour.....	22	1,359	61	.6	2,480
.8 or more.....	20	912	64	.9	2,027
Edmonton Inspected Cream Shippers:—					
Less than 1.0.....	19	1,415	38	.7	1,939
1.0 or more.....	24	1,020	47	1.2	1,647
Calgary Whole Milk Shippers:—					
Less than .7.....	16	3,339	43	.5	3,153
.7 or more.....	19	1,618	58	.8	2,279

If products are all sold at the same price the cash received would be a good measure of the physical volume of sales. This situation is approximately realized, within any one year, if the farms are carefully sorted according to the market in which their products are sold. Since this division was made in this study anyway, there was good reason to anticipate that within each group and within each year the cash receipts would be a satisfactory measure of the physical volume of products sold from the farm; and that if cash receipts were divided by the total manpower on the farm, as measured by man equivalents, the result would be a useful measure of physical volume of products sold per man. The farms were sorted on basis of the cash receipts per man as shown in Table 22.

TABLE 22.—THE EFFECT OF LABOUR EFFICIENCY AS MEASURED BY CASH RECEIPTS PER MAN, 1941-42.

Cash Receipts per Man	Number of farms	Average labour earnings	Cost per pound of butterfat	Average cash receipts per man	Average total capital
\$	No.	\$	¢	\$	\$
Edmonton Whole Milk Shippers:—					
Less than \$2,000.....	19	869	59	1,510	15,189
\$2,000 or more.....	23	1,375	64	2,887	24,478
Edmonton Inspected Cream Shippers:—					
Less than \$1,700.....	23	608	46	1,337	18,474
\$1,700 or more.....	20	1,869	40	2,281	27,525
Calgary Whole Milk Shippers:—					
Less than \$2,500.....	17	1,600	44	1,969	15,176
\$2,500 or more.....	18	3,165	61	3,348	19,283

Size of Business

MEASURES OF SIZE.—There is no one perfect measure of the effect of size in farm businesses on labour earnings. One reason is that size is a composite factor involving such unlike physical quantities as crop acres and numbers of animals, and the most desirable size is affected by circumstances and organization. For example, very high production per cow would have little effect on the earnings of a farmer who only had one or two cows. On the other hand a large herd with very low production per cow would probably cause bankruptcy. Another difficulty in appraising the most desirable size of the whole farm business is that the size required for best efficiency depends more on the size of the individual enterprises than on the general size of the farm as indicated by acres or labour requirements. However, there are several measures of the size of a farm business, all of which have some merit.

If reliable data were available concerning the time spent on all enterprises it would be possible to bring all enterprises to a common unit, namely, the number of ten-hour days required to perform the work at an average rate of performance. The result would be what is called Productive Man Work Units, and is probably the best single measure of size. The weakness of this measure is that it presupposes equal intensity of production among all farms.

Acres.—Another measure of size is the acres of crop land per farm. It is subject to the same criticism as man work units—that it does not measure intensity of operation—but this is not a highly variable factor on Alberta dairy farms and in groups of twenty farms or more, intensity is likely to average about the same in each group. The effect of size as measured by crop acres is shown in Table 25.

TABLE 25.—THE EFFECT OF SIZE AS MEASURED BY CROP ACRES, 1941-42

Crop Acres per Farm	Number of farms	Average labour earnings	Average crop acres	Crop acres as percentage of total acres	Percentage receipts from crops	Crop index	Cash receipts per man
Edmonton Whole Milk Shippers:—							
Less than 140.....	19	816	104	55	2	118	2,072
140 or more.....	23	1,418	311	68	6	106	2,423
Edmonton Inspected Cream Shippers:—							
Less than 270.....	24	1,105	181	62	5	113	1,598
270 or more.....	19	1,308	409	73	13	100	2,001
Calgary Whole Milk Shippers:—							
Less than 200.....	18	2,077	130	43	4	104	2,567
200 or more.....	17	2,752	392	52	7	91	2,796
Averages:—							
Lethbridge Whole Milk....	8	1,030	285	81	13	89	1,919
Calgary Inspected Cream..	12	1,123	266	40	5	103	1,729

Higher numbers of crop acres were associated with higher labour earnings in all whole milk and inspected cream groups during each year of the study. The same is true of total acres as indicated in Table 26 and in adjusted acres as indicated in Table 27.

TABLE 26.—SIZE OF BUSINESS AS MEASURED BY TOTAL ACRES, 1941-42

Total Acres per Farm	Number of farms	Average labour earnings	Cost per pound of butterfat	Crop Acres as percentage of total
Ac.	No.	\$	¢	%
Edmonton Whole Milk Shippers:—				
Less than 300.....	20	1,092	59	71
300 or more.....	22	1,195	65	63
Edmonton Inspected Cream Shippers:—				
Less than 350.....	25	1,040	47	69
350 or more.....	18	1,410	38	68
Calgary Whole Milk Shippers:—				
Less than 500.....	19	1,851	81	54
500 or more.....	16	3,062	44	53

TABLE 27.—SIZE OF BUSINESS AS MEASURED BY ADJUSTED ACRES, 1941-42

Adjusted Acres	Number of farms	Average labour earnings	Crop Acres as percentage of total acres
	No.	\$	%
Edmonton Whole Milk Shippers:—			
Less than 200.....	20	946	61
200 or more.....	20	1,328	66
Edmonton Inspected Cream Shippers:—			
Less than 300.....	22	1,109	67
300 or more.....	21	1,284	69
Calgary Whole Milk Shippers:—			
Less than 300.....	19	2,057	48
300 or more.....	16	2,818	50

Capital.—The effect of size as measured by total capital invested was given in Table 23. This measure has shown the most marked relation to labour earnings of any one general measure of size. The significance of capital as a measure of size depends on the accuracy in appraising property values. In Alberta a large file was compiled of recorded property sales, which were available as a check against original estimates of value.

TABLE 28.—THE EFFECT OF SIZE OF BUSINESS AS MEASURED BY CASH RECEIPTS, 1941-42

Cash receipts per farm	Number of farms	Average labour earnings	Cost per pound of butterfat	Average crop acres	Average total acres	Crop acres as percentage of total acres	Cash receipts per man	Crop index
	No.	\$	¢	Ac.	Ac.	%	\$	%
Edmonton Whole Milk Shippers:—								
Less than \$4,000.....	18	734	57	123	204	60	1,675	109
\$4,000 or more....	24	1,455	65	289	434	67	2,705	114
Edmonton Inspected Cream Shippers:—								
Less than \$5,000.....	25	558	47	216	329	66	1,410	103
\$5,000 or more....	18	2,080	38	374	523	71	2,285	114
Calgary Whole Milk Shippers:—								
Less than \$6,000.....	17	1,429	51	165	309	54	2,166	96
\$6,000 or more....	18	3,267	50	344	719	48	3,162	99

Cash Receipts.—Another measure of size of the farm business is the volume of cash receipts taken in during one year. This is shown in Table 28. This measure has the advantage that it includes the effect of intensity of production as well as of physical size of the farm, but it has the weakness that it is affected by prices paid and one year cannot be compared with another, also it is not possible to establish a standard for one type of farm which would apply to any other type. However, within the limits of the groups and year shown, the effect of size as measured by cash receipts on labour earnings is very marked. Part of the effect shown is due to high yields from crops or livestock. High yields affect receipts, although this would be offset to some extent in labour earnings by any added cost of production due to greater intensity of operation involved in obtaining the higher yields.

Animal Units.—Another measure of size that is useful on livestock farms is the total animal units. The manner in which animal units are calculated is described earlier. The effect of size as measured by animal units per farm is presented in Table 29. With an increase in animal units the labour earnings increase, as they do with other measures of size.

TABLE 29.—THE EFFECT OF SIZE OF BUSINESS AS MEASURED BY TOTAL ANIMAL UNITS PER FARM, 1941-42.

Total Animal Units	Number of farms	Average labour earnings	Average cost per pound of butterfat	Average number of cows per farm	Feed cost per cow	Average total animal units	Average animal units of hogs
A.U.	No.	\$	¢	No.	\$	A.U.	A.U.
Edmonton Whole Milk Shippers:—							
Less than 30.....	11	710	57.3	15	71	26	2
30 to 39.....	11	710	62.0	16	71	33	5
40 or more.....	20	1,626	64.3	26	93	65	17
Edmonton Inspected Cream Shippers:—							
Less than 40.....	14	736	47.9	13	58	35	10
40 to 49.....	6	702	44.2	15	61	45	15
50 or more.....	23	1,602	40.2	20	61	73	24
Calgary Whole Milk Shippers:							
Less than 30.....	9	1,317	49.0	17	47	25	1
30 to 69.....	16	2,168	54.5	31	75	55	5
70 or more.....	10	3,763	45.6	44	70	89	8

Size of Enterprises.—While the size of the whole farm is important, the effect of size is dependent on the size of individual enterprises. It is obvious, for instance, that the size which would permit the efficient operation of a combine would depend on the acreage of grain, rather than on the total acres or even crop acres. It is equally obvious that the size of the dairy herd determines when a milking machine could be added to advantage and not the total size of the farm.

The effect of the size of the dairy herd is given in Table 30 and the effect of the number of animal units in hogs is given in Table 31. In Table 30 it will be seen that the best labour earnings are obtained on farms with the largest dairy herds. The second largest earnings were found in the Edmonton area on those farms having the smallest herds: The lowest earnings in the Edmonton area were on the group of farms on which medium size herds were kept. A relationship in which a decrease occurs with the first increase in size and is followed by a rapid increase as the enterprise reaches a relatively large size, is usually found where other enterprises exist that are equally profitable or more profitable.

EFFECT OF HERD SIZE

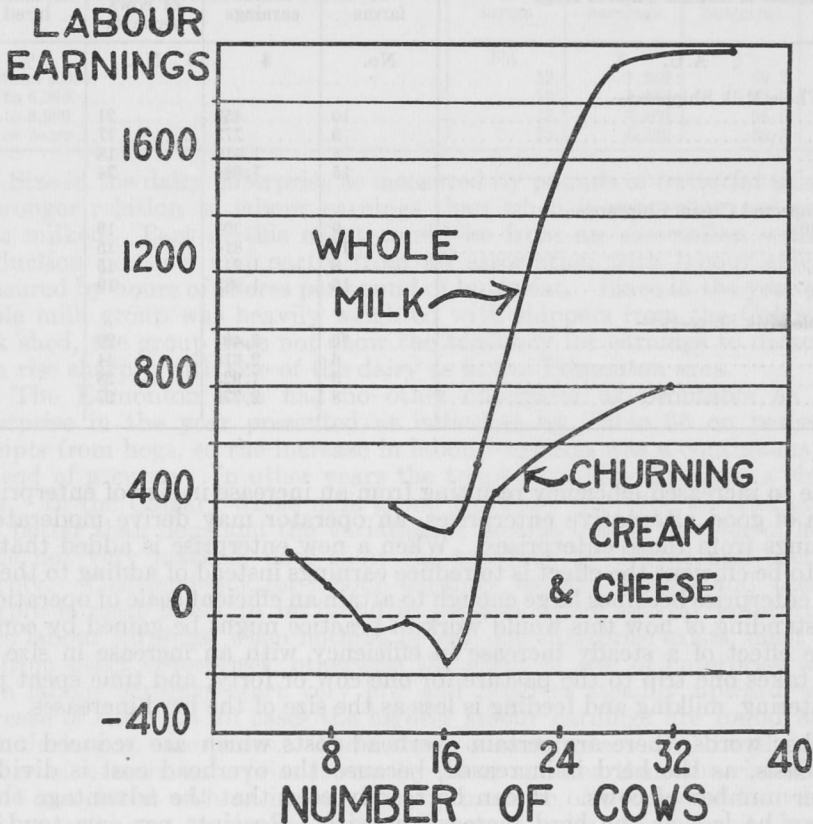


TABLE 30.—THE EFFECT OF SIZE OF HERD ON COSTS AND RETURNS, 1941-41.

Number of Cows	Number of farms	Average labour earnings	Net cost per pound of butterfat	Animal units of hogs per farm
	No.	\$	¢	A.U.
Edmonton Whole Milk Shippers:—				
Less than 15.....	13	881	59.1	7
15 to 19.....	14	715	56.6	6
20 to 24.....	6	860	62.3	9
25 or more.....	9	2,390	68.7	18
Edmonton Inspected Cream Shippers:—				
Less than 15.....	18	1,224	47.4	18
15 to 19.....	11	767	41.2	18
20 or more.....	14	1,493	40.4	21
Calgary Whole Milk Shippers:—				
Less than 20.....	11	1,365	49.6	4
20 to 29.....	6	1,802	62.8	6
30 to 39.....	9	2,494	53.1	9
40 or more.....	9	3,989	44.4	2

TABLE 31.—THE RELATION OF SIZE OF HOG ENTERPRISE TO VARIOUS FACTORS, 1941-42

Number of Animal Units of Hogs	Number of farms	Average labour earnings	Average number of cows per farm	Percentage of labour hired
A.U.	No.	\$	No.	%
Edmonton Whole Milk Shippers:—				
No. hogs.....	10	456	21	27
1 to 4.....	9	773	17	21
5 to 9.....	8	1,419	18	28
10 or more.....	15	1,684	24	43
Edmonton Inspected Cream Shippers:—				
Less than 10.....	9	204	19	11
10 to 14.....	10	814	15	21
15 to 19.....	8	1,211	15	19
20 or more.....	16	1,982	19	38
Calgary Whole Milk Shippers:—				
No. hogs.....	16	2,401	29	30
1 to 4.....	6	2,318	44	40
5 to 9.....	5	1,923	28	46
10 or more.....	8	2,778	27	31

This is due to increased efficiency resulting from an increase in size of enterprise. In an area of good alternative enterprises, an operator may derive moderately good earnings from those enterprises. When a new enterprise is added that is too small to be efficient the effect is to reduce earnings instead of adding to them, until that enterprise becomes large enough to attain an efficient scale of operation. An understanding of how this would work in practice might be gained by considering the effect of a steady increase in efficiency with an increase in size of herd. It takes one trip to the pasture for one cow or forty, and time spent per cow in watering, milking and feeding is less as the size of the herd increases.

In other words, there are certain overhead costs which are reduced on a per-head basis, as the herd is increased, because the overhead cost is divided by a larger number of cows. It can be readily seen that the advantage thus gained may be less as the herd increases in size. Receipts per cow tend to average about the same regardless of size of herd. Thus the reduction in cost per cow would be reflected directly in the loss or gain per cow. As the size of herd increases from one cow, the effect would be, first a reduction in loss per cow and then, when cost is reduced below receipts, an increasing gain but both at a decreasing rate of change. It will be noted that the Calgary whole milk farms did not show the same relation as the Edmonton district farms. This was because (1) they did not have another enterprise so generally profitable, as indicated in Table 35 on the percentage of receipts from the dairy and Tables 34 and 36 on the percentage of receipts from crops and hogs; and (2) the average size of herd was larger and their smallest size group averaged above the size, where increase due to size began in the Edmonton herds. (Table 30).

Table 31 shows the effect of size of hog enterprise as measured by the number of animal units of hogs per farm. In this table the situation is reversed so far as districts are concerned. The Edmonton district farms do not show a dip in earnings with an increase in the number of hogs, while Calgary whole milk farms do.

Since the size of the herd, as measured by cows milked, does not take into account the intensity of production, this feature can be combined into another measure namely the pounds of butterfat sold per farm, which would give the effect of number of cows times their production per cow. The effect of butterfat sold per farm is shown in Table 32.

TABLE 32.—THE EFFECT OF VOLUME OF DAIRY PRODUCTS, 1942-43.
(Whole milk Shippers)

Pounds of Butterfat Sold per Farm	Number of farms	Average labour earnings	Cost per pound of butterfat	Hours of chores per pound of butterfat
Lb.	No.	\$	¢	Hr.
Less than 5,000.....	12	1,562	69.2	.9
5,000 to 6,999.....	13	1,972	72.9	.8
7,000 to 8,999.....	13	2,860	64.0	.7
9,000 or more.....	15	4,262	58.5	.5

Size in the dairy enterprise as measured by pounds of butterfat sold showed a stronger relation to labour earnings than when it was measured merely by cows milked. Part of this effect would be from an association with rate of production per cow and partly from an association with labour efficiency as measured by hours of chores per pound of butterfat. Since in the year given the whole milk group was heavily weighted with shippers from the Calgary whole milk shed, the group does not show the tendency for earnings to decrease and then rise sharply with size of the dairy as in the Edmonton area.

The Edmonton area had no other enterprise as profitable as the hog enterprise in the year presented as indicated by Table 36 on percentage of receipts from hogs, so the increase in labour earnings was a continuous advance instead of a curve. In other years the trend showed a dip, then a rise in this area. In the Calgary whole milk group the dairy provided an alternative that was better than hogs and the variation of income due to number of hog units, while not very marked, does show the tendency to decline and then to rise sharply. This tendency for labour earnings to first decline and then to rise sharply is most likely to be found in an area where several enterprises exist since labour earnings, when nothing of any one enterprise exists, must be made up from other enterprises, otherwise the effect of size of enterprise will be to have labour earnings start very low and progress steadily upward with each increase of size. In all cases the highest labour earnings are found associated with the largest enterprises. The increase of earnings associated with an increase in size of a main enterprise is usually much greater than the rise of earnings found associated with an increase of any measure of the size of the whole farm such as crop acres, total acres, or total livestock units. Some quite large farms are found with so many enterprises that none of these enterprises is up to the most efficient size. For hogs this size seems to be over 10 animal units or more than 50 hogs reaching market per year; and for the dairy enterprise the most efficient size is over 20 cows milked.

One problem always raised when considering an increase in the size of business is the labour required for an increase of crops or livestock. To check this problem the farms were sorted on the basis of the percentage of total farm labour that was hired. The percentage of labour hired was associated with the size of the farm businesses as is indicated by the average total animal units per farm and by the animal units of hogs per farm. The results are shown in Table 33.

The labour earnings in the groups that hired some labour were higher than in the groups that hired little or no labour. Furthermore, efficiency of production as indicated by butterfat sold per cow was actually highest in the groups that hired most of their labour. Thus, while utilizing extra help is always a problem it is apparently one which most farm operators can manage very satisfactorily.

Combination of Enterprises

PRINCIPLES INVOLVED.—The most profitable combination of enterprise on a farm is difficult to determine. There was no measure of combination of enterprises that indicated a consistent relationship to operator's labour earnings

TABLE 33.—THE EFFECT OF PERCENTAGE OF LABOUR HIRED, 1941-42

Percentage of labour hired	Number of farms	Average labour earnings	Average cost per pound of butterfat	Average number of cows per farm	Butter- fat sold per cow	Feed cost per cow	Concen- trates fed per animal unit of dairy cattle	Average total animal units	Average animal units of hogs
%	No.	\$	¢	No.	Lb.	\$	Lb.	A.U.	A.U.
Edmonton Whole Milk Shippers:—									
None hired.....	16	785	57.9	15	208	66	2,478	31	5
1 to 49.....	9	1,714	66.2	24	232	85	2,606	50	7
50 or more.....	17	1,185	63.5	25	203	94	3,084	59	15
Edmonton Inspected Cream Shippers:—									
None hired.....	17	502	47.3	17	213	59	1,614	48	13
1 to 49.....	19	1,586	41.9	17	221	60	1,837	57	19
50 or more.....	7	1,813	35.8	18	208	61	2,189	76	31
Calgary Whole Milk Shippers:—									
Less than 20.....	9	1,467	50.8	26	249	70	2,154	48	2
20 to 59.....	20	2,729	47.9	30	244	69	2,198	56	7
60 or more.....	6	2,732	53.7	43	274	77	2,806	74	3
Averages:—									
Lethbridge Whole milk.....	8	1,030	58.6	43	259	82	.....	137	9
Calgary Inspected Cream.....	12	1,123	51.0	16	251	72	.....	73	13

in every market group. This is probably because the most profitable combination is usually a compromise between two conflicting principles, namely that of specialization and that of diversification.

There is a long-time tendency towards specialization in agriculture, because specialization helps to obtain high efficiency in production. Specialization has been greatest in the types of farming in which the effects of weather are more or less controlled and in areas where some particular enterprise is much more profitable than others. In general, the degree of specialization is limited mainly by the weather and the seasonal nature of crop production.

Diversity has the advantage that by a combination of enterprises, the by-products or idle working force from one enterprise may be profitably utilized in another enterprise. Since crop production is seasonal the inclusion of live-stock enterprises may provide some income in winter, whereas with crops alone there would be none. The question of which principle is the more important one depends on: (a) the amount of difference in returns per hour of labour between the highest and other enterprises; and (b) the types of by-products or amount of idle labour left.

There are few completely specialized farms in Alberta, yet there are many farms on which a high degree of specialization exists. From the standpoint of a farm operator in Alberta the decisions concerning the best combination of enterprises usually are: (a) the choice of the best paying enterprise; and (b) a combination of other enterprises with it which will utilize by-products, labour, and untillable land to the best advantage without interfering too seriously with the main enterprises.

MAIN ENTERPRISES.—The choice of best paying enterprise on a farm is a very important factor in determining the earnings, and operators undoubtedly do try to plan for the maximum amount of their time to be spent on the best paying enterprises. Their ability to choose correctly would be greatly aided if cost accounts were kept for all farm enterprises on enough farms to give a representative picture of the returns per hour of labour from each enterprise. Since measuring the percentage of time spent on highest paying enterprises would involve the classification of all enterprises according to returns per hour of labour, it cannot be done without complete cost accounts to supply the information. However, some information can be gained by sorting the farms on the basis of the percentage of receipts from important enterprises.

Cash Crops.—Table 34 gives the effect of receipts from crops. The farm operators having the highest proportion of receipts from cash crops had the highest labour earnings. Part of the increase would be due to an association with higher crop yield index in the Calgary whole milk farms, but in the Edmonton whole milk group high crop sales and the higher labour earnings were associated with lower crop index.

TABLE 34.—COMBINATION OF ENTERPRISES: EFFECT OF GROWING CROPS FOR SALE, 1941-42

Percentage Receipts from Crops	Number of farms	Average labour earnings	Crop acres as percentage of total acres	Percentage receipts from crops	Crop index	Average crop acres
%	No.	\$	%	%	%	Ad.
Edmonton Whole Milk Shippers:—						
No. receipts.....	20	1,003	60	.....	116	134
1 or more.....	22	1,276	67	8	104	292
Edmonton Inspected Cream Shippers:—						
Less than 5.....	22	1,108	67	1	107	206
5 or more.....	21	1,285	70	17	108	361
Calgary Whole Milk Shippers:—						
No. receipts.....	16	1,968	48	.....	82	236
1 or more.....	19	2,773	50	10	111	275

Dairying.—Table 35 indicates the effect of concentration on dairying. In the Calgary whole milk group the effect of concentrating on the dairy enterprise is to increase labour earnings. In all groups the result was lower costs per pound of butterfat produced. However farmers in the Edmonton whole milk and inspected cream groups who had a higher percentage of receipts from the dairy had lower labour earnings. The percentage of receipts from the dairy on the average was quite high.

The Edmonton whole milk shippers received more from the dairy than their average cost and, when the farms were sorted on the size of the dairy herd, the highest labour earnings were found where the dairy herds were largest. The crop acres were lowest where the greatest percentage of receipts came from the dairy, which suggest that the variation in the percentage of receipts from the dairy came from the size of other enterprises rather than from the dairy. Therefore, the lower labour earnings in Table 34 do not mean that the dairy enterprise was not a good enterprise to have but that it was better to have it in combination with other enterprises.

TABLE 35.—COMBINATION OF ENTERPRISES: EFFECT OF CONCENTRATION ON DAIRY ENTERPRISE, 1941-42

Percentage Receipts from dairy	Number of farms	Average labour earnings	Cost per pound of butterfat	Cash receipts per man	Crop acres as percentage of total acres	Crop index	Average crop acres per farm
No.	\$	¢	\$	%	%	%	Ac.
Edmonton Whole milk Shippers:—							
Less than 60.....	19	1,222	66	2,577	65	104	258
60 or more.....	23	1,083	60	2,006	65	119	184
Edmonton Inspected Cream Shippers:—							
Less than 37.....	21	1,511	43	2,022	76	109	349
37 or more.....	22	893	43	1,541	60	106	218
Calgary Whole Milk Shippers:							
Less than 70.....	17	2,153	55	2,793	56	100	302
70 or more.....	18	2,643	47	2,570	43	96	214

Hogs.—The effect of percentage of receipts obtained from hogs is shown in Table 36. In the Calgary whole milk group the highest labour earnings were obtained where there were no hogs. In the Edmonton area both whole milk and inspected cream farms had the highest incomes where the greatest percentage of receipts came from hogs. The Edmonton area grows a better quality of barley or oats than of wheat due to the relatively high soil moisture and a short frost-free period. The bulk of the Calgary whole milk comes from the foothills west of Calgary where the rolling topography is more suited to pasture than to crop land. The better crop areas near Calgary produce a higher quality of wheat than of barley and hence do not find so much advantage in hog raising.

TABLE 36.—COMBINATION OF ENTERPRISES: EFFECT OF CONCENTRATION OF HOGS, 1941-42.

Percentage Receipts from Hogs	Number of farms	Average labour earnings	Cash receipts per man	Crop acres as percentage of total acres	Crop index	Average crop acres
%	No.	\$	\$	%	%	Ac.
Edmonton Whole Milk Shippers:						
No receipts.....	22	795	2,039	61	117	150
1 or more.....	20	1,533	2,511	67	107	292
Edmonton Inspected Cream Shippers:						
Less than 30.....	19	837	1,754	67	100	314
30 or more.....	24	1,478	1,794	70	113	257
Calgary Whole Milk Shippers:						
No receipts.....	29	2,430	2,751	50	97	256
1 or more.....	6	2,285	2,330	48	101	263

Other Stock.—There were very few herds of beef cattle within the area studied and, while some were combined with a dairy enterprise, they were insufficient in number to give a significant average. It was worthy of note that the farms with large beef enterprises were mostly large farms having some pasture too remote from the buildings for cows that have to be milked twice a day. On a few farms poultry enterprises were found that represented an important part of the income but these were also too few to give a significant average.

Sheep were not common in the area of study. The one area where they were frequently found was in the grey soil transition area where sheep are grazed extensively on cut-over land, prior to final clearing and breaking. Here they perform a useful function in keeping down second growth as well as providing income from assets that might otherwise be wasted.

COMBINATION OF ENTERPRISES—*Variation by Areas.*—With the rather limited choice of paying enterprises in each district the combination of enterprises was also restricted. Apart from the few unusual enterprises such as poultry and fur farming, the combination in the Calgary milk shed seemed to be dairying plus cash grains. The choice appeared to be determined largely by the relative proportions of rolling and tillable land.

In the Edmonton district the number of paying enterprises was larger and the combinations of enterprises more numerous. Hogs supplied more of the income in the Edmonton district and were the largest single source of receipts in the cream producing areas. In the whole milk areas the combinations usually found were dairying with either cash crops or hogs and occasionally both. Poultry were also important sources of income on a few farms. There were fewer specialized dairy farms than in the Calgary area. The Edmonton district cream farms were mostly combinations of dairying, cash crops, and hogs with variations due chiefly to differences in the percentage of land tillable. It may be observed from Tables 35 and 36 that the high percentage of receipts from crops is associated with a higher number of crop acres per farm and a higher percentage of the total acres cropped. Farms having the greatest percentage of receipts from dairying had fewer crop acres per farm and a lower percentage of total acres cropped. The dairy, then, utilizes rough or uncultivated land as pasture and its importance in the combination usually depends to some extent on the quantity of such pasture.

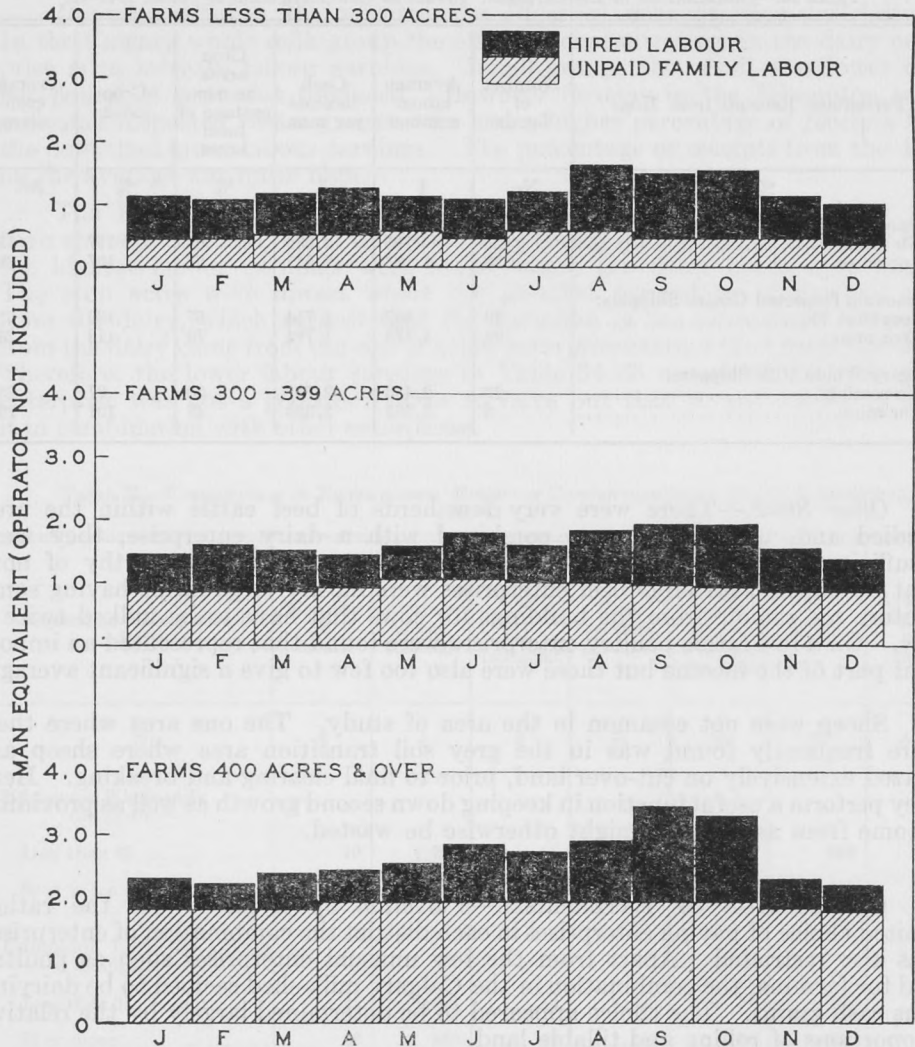


CHART 2.—Distribution of Labour on Churning Cream Farms by Months, 1939-40¹

Relation to Use of Capital and Labour.—There is no one enterprise that provides an equal distribution of labour throughout the day or year, nor a complete utilization of its own by-products. For this reason combinations of two or three enterprises usually give a more rapid turnover on capital than any one enterprise alone. Dairying has a peak requirement for labour at milking time and a comparatively low requirement through the day. It also requires more labour in winter than in summer. Crops are opposite in requirements. They are very seasonal with large amounts of labour required in good weather and very little required in bad weather. They require large amounts of labour in summer and practically none in winter. A combination of crops and dairy gives a much better distribution than either alone, as may be seen from Chart 2.

¹ Patterson, H. L. and B. H. Kristjanson, "Alberta Dairy Farmers' Labour Problems", The Economic Annalist, Page 24, May 1943.

The by-products of crops, such as straw and screenings or low grade grain, can only be utilized to best advantage through livestock. A combination of crops and livestock that would use all labour and crop by-products, to the fullest extent, would provide additional income without a corresponding amount of capital outlay. The effect of such a combination on the efficiency in the use of capital may be seen in Table 37.

TABLE 37.—THE EFFECT OF CAPITAL IN LIVESTOCK, 1941-42

Percentage of Capital in Livestock	Number of farms	Average labour earnings	Average total capital	Average years for cash receipts to equal capital
%	No.	\$	\$	Yr.
Edmonton Whole Milk Shippers:				
Less than 15.....	17	925	22,917	4.5
15 or more.....	25	1,296	18,480	3.6
Edmonton Inspected Cream Shippers:				
Less than 12.....	19	605	26,510	5.8
12 or more.....	24	1,661	19,654	4.2
Calgary Whole Milk Shippers:				
Less than 20.....	14	1,742	21,064	3.8
20 or more.....	21	2,847	14,771	2.9

The farms with the highest percentages of capital invested in livestock had the most rapid turnover of capital, as measured by the years required for cash receipts to equal capital. The only situation in which highest returns would be secured from one enterprise alone would be where that enterprise was so outstanding as a best paying enterprise that this feature would overcome the advantages of a combination of enterprises. This condition does exist where soil and climatic conditions give a special advantage to one crop as in some of the wheat growing areas; or where a high percentage of the land is not suited to cultivation and only animals that live largely on pasture and roughage can utilize it to advantage, as on many ranches. Part of the Calgary milk shed approaches this latter condition.

Another factor tending towards specialization is the increasing use of expensive equipment. The effect of percentage of capital in equipment is shown in Table 38.

TABLE 38.—THE EFFECT OF PERCENTAGE OF CAPITAL IN EQUIPMENT, 1941-42

Percentage of Capital in Equipment	Number of farms	Average labour earnings	Cash receipts per man
%	No.	\$	\$
Edmonton Whole Milk Shippers:			
Less than 16.....	19	1,044	2,322
16 or more.....	23	1,230	2,216
Edmonton Inspected Cream Shippers:			
Less than 17.....	19	1,132	1,670
17 or more.....	24	1,244	1,860
Calgary Whole Milk Shippers:			
Less than 16.....	13	2,024	2,275
16 or more.....	22	2,630	2,917

The farms with the highest percentage of investment in equipment have the highest labour earnings. They normally also have higher labour efficiency as indicated by cash receipts per man, although the Edmonton whole milk shippers in the year under review showed a temporary reversal of this tendency. However the gain in labour earnings is not very marked. Neither is the gain in labour efficiency very great. The reasons for this small apparent advantage from investment in equipment probably lies in the high fixed cost of equipment and in the difficulty of having enough work to make the best use of the most efficient machines. In Alberta the most extensive use of such machinery is on grain farms and on some farms the tendency is to concentrate entirely on grains in order to justify the use of special machines such as threshers and tiller combines. There is a tendency among the most successful operators to get the most out of big and efficient machines without an investment disproportionate to the job to be done, by contracting the work. For example, the two operators with highest earnings in the Edmonton area had their hay put up on contract by neighbours who had very good equipment. At the same time one of these operators contracted to deliver all his neighbour's milk along with his own. Thus it is possible to get the efficiency that goes with good equipment by using it on several farms and keeping down the amount of capital required, while using the available acreage for more than one type of crop. This is essential if a good rotation is to be followed. A rotation of crops is important to control weeds, diseases, and insects, to maintain humus and to distribute labour. These problems are much more difficult to control where there is only one enterprise. In Table 19 it was indicated that the acreage of uncultivated land per farm is quite high. This land represents an investment and the use that is made of it will materially affect the efficiency in the use of capital.

Combined Effect of Efficiency Factors

In previous tables the effect of each factor has been measured by sorting on a measure of that factor and using groups of farms to give all other factors an opportunity to average out. Where factors were linked together this has been indicated, otherwise the effect on labour earnings was largely the effect of one factor with the other factors tending to average about the same as in the whole group of farms. However, it is important to know what the combined effect of all the factors would be on the operator's labour earnings. For this purpose the best single measures available of each factor were selected on the basis of their relation to the factors to be measured, and then the farms were sorted on whether they were average or better on each of the measures of efficiency. In this way the farms were grouped as being average or better in no factors (0), one factor (1), two factors (2), three factors (3), and four (4) or five (5) factors, and the results are shown in Table 39.

It will be seen that the number of factors in which a farm operator excels has a very strong relation to his labour earnings or return for his year's work and management. However, it is not easy to excel in all five efficiency factors. Only 3 farm operators out of 53 were average or better in all five factors. Reaching that point is usually the result of years of planning and improving. Since the business will only last the active lifetime of one man, it is very desirable that every new operator starting in should learn the best organization and goals for his particular farm as soon as possible in order that the necessary changes can be made as early as possible.

TABLE 39.—THE CUMULATIVE EFFECT OF FACTORS AFFECTING INCOME, 1942-43
(53 Whole Milk Shippers)

	Number of farms	Average labour earnings
	No.	\$
Number of Factors Average or higher:		
0.....	4	-620
1.....	11	1,929
2.....	13	2,571
3.....	15	3,605
4.....	7	3,985
5.....	3	5,262
Average of Five Factors:		
Livestock: Butterfat per Cow..... Lb.		268
Crops: Crop Yield Index..... %		114
Labour: Cash Receipts per Man..... \$		2,886
Capital: Years for Cash Receipts to Equal Capital..... Yr.		3.0
Size: Crop Acres..... Ac.		250

Since markets and prices are constantly changing, the basic information necessary to make such decisions correctly will need to be kept up to date.

PART II

CHURNING CREAM, CHEESE, AND CONDENSED MILK SHIPPERS

Description of Farms

TOTAL ACRES PER FARM.—The northern cream and cheese farms averaged 365 acres per farm as will be seen in Table 40. This is between a half and a three-quarter section of land. The farms in the condensery area around Red Deer are very similar in acreage. This area is, in fact, an extension of the black soil belt southwards except that at the southern and western edges the shallow black and the grey soils come into the picture. The Rosemary and Coaldale cheese milk shippers are located on irrigated land in the brown soil zone and they have fewer acres of land.

TABLE 40.—AVERAGE ACRES BY TYPE OF MARKET

	Number of farms	Crop acres	Adjusted acres	Total acres
	No.	Ac.	Ac.	Ac.
Northern cream farms, 1941.....	72	216	255	365
Northern cheese farms, 1941.....	20	227	280	
Rosemary cheese farms, 1941.....	29	129	143	225
Coaldale cheese farms, 1941.....	21	113	122	392
Condensery milk farms, 1942.....	49	237	291	

CROP ACRES.—The crop acreage was about twice as high in the dry land areas as on the irrigated farms. The 216 and 227 acres cultivated were the equivalent of one and one-third quarter sections under cultivation in the northern area, and the 113 and 129 acre averages in the irrigated area were the equivalent of three-quarters of one-quarter section cultivated.

ADJUSTED ACRES.—The adjusted acres is the sum of crop acres plus one-third of the wild open pasture and one-tenth of the bush pasture. On irrigated farms a further adjustment was made on uncultivated dry land to bring it to irrigated land equivalent.

TABLE 41.—CULTIVATION PATTERN, BY AREAS, 1941.

	Edmonton area	Calgary area	Irrigated area
	Ac.	Ac.	Ac.
Oats.....	58	55	15
Wheat.....	35	37	35
Barley.....	46	13	6
Mixed grain.....	3	1	10
Grain bundles.....	18	44	9
Alfalfa.....	7	5	14
Sweet clover.....	2	4	4
Wild hay.....	10	14	.....
Other hay.....	9	10	2
Grass seed.....	1	.....	1
Sugar beets.....	.....	.....	6
Peas.....	.....	.....	4
Flax.....	.....	.....	8

ACREAGES OF IMPORTANT CROPS.—The important crops grown by districts are given in Table 41. In the dry land areas oats were the largest single acreage. In the Edmonton or black soil area, barley was second in acreage but on the shallow black soils around Calgary barley was of less importance. Wheat was constant in all areas; and perhaps the greatest variation is in the source of roughage. On irrigated farms alfalfa hay is the most important source of roughage with sweet clover second. On the dry land farms, grain bundles were the most important source of roughage with wild hay second. In the black soil zone tame hay and alfalfa were not far behind wild hay in acreage. The more intensively cultivated crops like sugar beets and peas were more commonly found on the irrigated land.

ANIMAL UNITS.—A discussion on how animal units are calculated is given in Part I of this report¹. The animal units per farm are shown in Table 42.

TABLE 42.—AVERAGE PRODUCTIVE ANIMAL UNITS PER FARM, 1941 to 1942¹.

	Edmonton Area		Irrigated cheese milk farms	Condensery farms
	Churning cream farms	Cheese milk farms		
	A.U.	A.U.	A.U.	A.U.
Dairy cattle.....	14.0	18.9	10.0	17.6
Beef cattle.....	1.4	1.8	.4	2.9
Sheep.....	1.1	.6	.2	.8
Swine.....	14.5	10.7	7.5	9.9
Poultry.....	1.1	.8	.8	.8
Total Animal Units ²	38.6	38.6	25.1	38.8

¹ The condensery farm figures are for 1942 to 1943.

² The total animal units include horses.

It will be seen in Table 42 that the irrigated farms had fewer livestock than the dry land farms. This difference in livestock numbers is due to smaller size of business on the irrigated farms. On the dry land farms the churning cream producers have fewer dairy cattle and more hogs than either cheese milk or condensed milk shippers.

¹ See reference to Animal Units under "Description of Farms", Part I.

Beef cattle were not kept on many of the farms studied. Where there were any beef cattle there was usually a large herd. They were usually found on large farms where a quantity of rough land pasture was too far from the buildings to be utilized by cows that have to be milked twice per day.

Poultry units were small and about the same size in all groups. They were kept mostly for home use and the same amount sufficed on the average for all groups.

Sheep were most commonly found in the areas where bush was still being cleared. Here they grazed on the cut-over land and kept down the second growth.

Financial Summary

The average labour earnings of the northern farms producing churning cream and cheese milk (shown in Table 43) indicate that the years became more favourable from 1939 on. While cost per pound of butterfat increased steadily, the prices of all farm products also advanced. The increases of labour earnings may seem substantial but they are just about equal to the increases in farm wages for the corresponding years, except 1939 to 1941. In fact the average operator's labour earnings in each year was somewhat similar to the top wage plus board received by help hired on the farms. In some years and in some groups the operator's labour earnings were less than wages of hired help for example in 1939 in both churning cream and cheese groups, and among the condensery patrons in 1942-43. These very low labour earnings were earned in times and places where poor crops were obtained and while little crop was sold the effect was felt through decreased inventory of feed and supplies, and through a decrease of sales from stock like hogs that are directly dependent on the volume of feed available.

TABLE 43.—FINANCIAL SUMMARY

	Churning cream farms	Northern cheese milk farms	Irrigated cheese milk farms	Condensery patron farms
	\$	\$	\$	\$
Labour Earnings:—				
Averages: 1939-40.....	134	1		
1940-41.....	694	579		
1941-42.....	852	653	1,077	
1942-43.....	1,307			755
The highest labour earnings.....	4,921	5,508	2,890	3,130
The lowest labour earnings.....	-3,625	-1,352	-319	-1,820
Milk Cost per Pound Butterfat:—				
Averages: 1939-40.....	.356	.376		
1940-41.....	.312	.328		
1941-42.....	.372	.401	.348	
1942-43.....	.540			.640
The highest cost per pound butterfat.....	.74	.89	.60	1.34
The lowest cost per pound butterfat.....	.12	.15	.09	.35
Dairy Returns per Hour of Labour:—				
Averages: 1941-42.....	.19	.20	.38	
1942-43.....	.19			.21
The highest returns per hour.....	.64	.49	.78	.57
The lowest returns per hour.....	-.14	-.09	-.06	-.30

The change from one year to another or from one group to another is due to prices of farm products and the type of production and while these differences are important, far greater variation is to be found between the high and low

farms within one group and within any one year. For example, the churning cream producers ranged from an operator who earned labour earnings in one year of \$4,921 to one who fell \$3,625 short of earning anything for his year's work. Both these farms were well above average in size so that further search must be made for the causes of the difference. While churning cream producers on the average only earned 19 cents per hour from work in the dairy, the range was from a high of 64 cents per hour earned to a loss of 14 cents per hour. Variation of earnings in the other groups was also very great.

Livestock

PRODUCTION PER COW.—*Relation to Earnings.*—The effect of rate of production per cow on labour earnings is twofold. First, the ability of a cow to produce large quantities of butterfat is associated with some increase of efficiency in the conversion of the feed fed. Second, there is some saving in overhead cost per unit of output where there is more output per cow. The effect of production per cow is presented in Table 44.

TABLE 44.—THE RELATION OF PRODUCTION PER COW TO FEEDS AND RETURNS, 1941-42

Production per cow in pounds of butter- fat	Number of farms	Average labour earnings	Net cost per pound of butterfat	Crop index	Concen- trates per dairy animal unit	Roughage per animal unit	Value of feed fed per dairy animal unit	Average pounds of butterfat sold per cow
Lb.	No.	\$	¢	%	Lb.	T.	\$	Lb.
Edmonton Churn- ing Cream and Cheese Farms:—								
Less than 180..	21	591	40·0	99	658	2·14	24	148
180 to 219.....	31	741	38·0	93	925	2·36	28	175
220 to 259.....	20	776	40·4	103	1,375	2·45	36	207
260 or more...	20	1,286	30·8	106	1,492	2·25	42	259
Rosemary and Coaldale Cheese Farms:—								
Less than 230..	28	851	33·0	90	563	1·60	20	180
230 or more...	22	1,366	33·2	104	1,508	2·20	31	262

The effect of each increase in production per cow was to increase the operator's labour earnings. This gain in labour earnings might be partially an association with crop yield index. The higher production per cow was associated with larger quantities of grain fed per animal unit which in turn was associated with higher grain yields as indicated by crop yield index. Having good cows paid well, but with cows that do not respond well to feed, increased production may be gained at too high a cost in feed.

Relation to Grain Fed.—To be profitable, livestock must convert feeds into products which are considerably more valuable than the feed. Therefore the relationship between the prices of feed fed and the product sold is very important. Grain prices are usually high enough to make it dear relative to roughages as a source of nutrients. Thus, while cows will produce more heavily with heavier grain feeding, the cost per pound of butterfat may be higher because of the more expensive form of feed used. This is illustrated in Table 45.

TABLE 45.—THE EFFECT OF THE RATE OF FEEDING CONCENTRATES IN THE DAIRY ENTERPRISE 1941-42

Pounds of Concentrates Fed per Animal Unit	Number of farms	Average labour earnings	Average cost per pound of butterfat	Feed cost per cow	Concentrates per dairy animal unit	Roughage per animal unit	Butterfat sold per cow
Lb.	No.	\$	¢	\$	Lb.	T.	Lb.
Edmonton Churning Cream and Cheese Farms:—							
Less than 600.....	23	695	36.2	37	233	2.27	163
600 to 999.....	21	607	37.7	38	757	2.37	170
1,000 to 1,399.....	23	971	35.5	51	1,192	2.19	206
1,400 or more.....	25	1,022	38.1	62	2,013	2.36	229
Rosemary and Coaldale Cheese Farms:—							
Less than 500.....	17	911	30.4	30	279	1.51	172
500 to 999.....	15	970	31.4	35	710	1.74	225
1,000 or more.....	18	1,353	33.6	48	1,807	2.28	242

The increased grain feeding increased the cost of feed per animal unit and the cost per pound of butterfat depended on whether the butterfat sold per cow increased as rapidly as the value of feed per animal unit. The effect on cost per pound of butterfat was not very marked until 1,400 or more pounds of concentrates were fed per animal unit, then the cost per pound increased significantly.

Relation to Other Factors.—The relationship of production per cow to other factors of production is presented in Table 46.

TABLE 46.—THE RELATION OF PRODUCTION PER COW TO OTHER FACTORS AFFECTING INCOME, 1942-43

Butterfat produced per cow	Number of farms	Average labour earnings	Average crop index	Livestock values as percentage of capital	Average total capital	Hours of chores per pound of butterfat
Lb.	No.	\$	%	%	\$	Hr.
All Cream Farms:—						
Less than 210.....	23	1,102	99	21	19,686	1.44
210 or more.....	25	1,658	112	20	18,692	1.03
All Condensery Farms:—						
Less than 230.....	23	372	92	19	14,848	1.30
230 or more.....	26	1,093	100	22	11,150	.89

The relation between production per cow and crop yield index is very noticeable. It is apparently due to the tendency of churning cream and condensed milk shippers to feed less than optimum amounts of grain unless they have a good crop and low prices prevail for the grain locally.

In the 1940-41 account year the effect of higher production per cow was further complicated by relatively high prices for beef and low prices for churning cream and cheese milk. In that year the herds producing less than 180 pounds of butterfat per cow or with definitely beef type cows received higher labour earnings than any except the highest producing group of dairy herds. This is further evidence that, in spite of the temporary variations to be found in the relationship of higher production per cow, to operator's labour earnings or cost per pound of butterfat, it pays well to keep cows capable of high production.

FEEDING EFFICIENCY.—One of the considerations in efficient feeding of dairy cattle is the quantity of pasture available. This is a difficult matter to arrange as the productivity of pastures varies greatly and may deteriorate rapidly during a hot, dry summer. The effect of having an abundance of pasture available in 1941-42 is given in Table 47.

TABLE 47.—THE EFFECT OF PASTURE AVAILABLE PER COW, 1941-42

Acres of adjusted pasture per animal unit	Number of farms	Average labour earnings	Cost per pound of butter-fat	Animal units of cows per farm	Value of feed fed per unit of dairy stock	Average butter-fat sold per cow	Feed cost per pound of butter-fat
Ac.	No.	\$	¢	A.U.	\$	Lb.	†
Dry Land Cream and Cheese Farms:—							
Less than 3.....	31	751	40.0	11.6	29	188	24.2
3 and 4.....	32	765	37.0	9.6	29	190	25.2
5 or more.....	29	995	34.7	8.3	33	199	26.0
Rosemary and Coaldale Irrigated Cheese Farms:—							
Less than 2.....	19	1,042	33.2	7.6	26	219	18.1
2 or more.....	31	1,099	33.7	5.7	23	213	17.5

Where acres of pasture per dairy animal unit were highest the labour earnings were highest, and in the northern group the cost per pound of butterfat was lowest. The 1941-42 year was normal in the north but in the southern part of the province, in the area of the Rosemary and Coaldale cheese factories there was more than the usual amount of summer rainfall, and with irrigation effect of additional acres of pasture was much lower. The following year the summer rainfall was unusually high all over Alberta and no effect from extra acres of pasture was discernible in any area. Pasture appears to be an important problem only in dry years.

Another comparison made was the feeding of straw versus no straw fed inside the barn. When the farms were sorted on the percentage of food nutrients supplied by straw, the cream shipping farms that fed over 20 per cent of their nutrients as straw had costs of four cents less per pound of butterfat than the average of those farms where no straw was fed. Where it is abundant and close to the barn, straw is usually a very cheap source of digestible nutrients. A stockman could not afford to pay very much for it.

TABLE 48.—THE EFFECT OF EFFICIENCY IN THE USE OF DAIRY FEED, 1942-43

Returns per \$100 worth of feed fed	Number of farms	Average labour earnings	Cost per pound of butter-fat	Value of feed per dairy animal unit	Butter-fat sold per cow	Returns per dairy animal unit	Total milk receipts per cow
\$	No.	\$	¢	\$	Lb.	\$	\$
Cream Farms:—							
Less than 200.....	21	1,248	72	48	191	73	81
200 to 299.....	22	1,369	49	36	225	86	97
300 or more.....	5	2,089	39	25	237	101	96
Condensery Farms:—							
Less than 200.....	21	345	80	52	189	77	94
200 or more.....	28	1,064	56	38	234	102	120

The importance of efficiency in the use of dairy feed is further indicated in Table 48 giving dairy returns per \$100 worth of feed fed. This table indicates that operators who had high returns per \$100 worth of feed fed had higher labour earnings and a much lower cost per pound of butterfat. The higher returns per \$100 worth of feed was associated with higher production of butterfat per cow, again indicating that the capacity to produce is a necessary requisite to efficient feeding.

LIVESTOCK INDEX.—While the production per cow is important, the churning cream producers only received about 30 per cent of their receipts from the dairy and Table 42 indicates that cream producers kept more animal units of hogs than of dairy cattle. To get a measure of returns per animal from all livestock, an index was calculated for each farm. The effect of efficiency with all livestock as indicated by livestock index is shown in Table 49.

TABLE 49.—EFFICIENCY WITH ALL LIVESTOCK AS MEASURED BY LIVESTOCK INDEX, 1941-42

Livestock index	Number of farms	Average labour earnings	Cost per pound butterfat	Percentage receipts from crops	Cash receipts per man	Hours of dairy chores per pound of butterfat
%	No.	\$	¢	%	\$	Hr.
Edmonton Churning Cream and Cheese Farms:—						
Less than 90.....	28	399	43	10	1,124	1.2
90 to 99.....	22	879	37	8	1,379	1.0
100 or more.....	42	1,098	34	13	1,553	1.0
Rosemary and Coaldale Cheese Milk Farms:—						
Less than 100.....	26	890	38	26	1,380	1.0
100 or more.....	24	1,282	30	34	1,539	.7

On farms having a high livestock index the labour earnings were much higher and the cost per pound of butterfat much lower than on farms with low livestock indexes. High rates of production are important with all classes of livestock. In the case of swine this could best be measured by the number of hogs sold per brood sow if pigs are raised or by pounds of feed required to make one pound of gain, if feeders are bought and finished. The Alberta provincial average, according to statistics available, is about 7 living pigs per litter with about one-half of the brood sows failing to produce a second litter, which would mean about 10 to 11 pigs marketed annually per brood sow kept. More than these averages would be required for a high livestock index.

Crops

RELATION TO EARNINGS.—Crops are important to the operator's labour earnings whether they are sold or fed to livestock. While only around 10 per cent of the Alberta dairy farm receipts were derived from the sale of crops, the livestock enterprises were usually limited by the feed grown on the farm. The yields per acre of crops were compared on farms by calculating for each farm a crop index which gives the yield per acre as a percentage of average. The effect of crop yields as measured by crop index is shown in Table 50.

TABLE 50.—THE EFFECT OF CROP YIELD AS MEASURED BY CROP INDEX, 1942-43

Crop index	Number of farms	Average labour earnings	Cost per pound of butterfat	Percentage of receipts from crops	Average crop index	Cash receipts per Man	Crop acres as percentage of total acres	Average crop acres
%	No.	\$	¢	%	%	\$	%	Ac.
All Cream Farms:								
Less than 110..	24	1,132	58	9	80	1,825	56	318
110 or more...	24	1,650	56	11	132	2,003	68	236
All Condensery Farms:—								
Less than 100..	28	596	67	8	80	1,779	62	280
100 or more...	21	966	59	9	118	1,599	58	179

The farms having highest crop indexes also had the highest labour earnings and the lowest cost per pound of butterfat. Since the feeds are charged to the dairy at market prices, high yields may increase the labour earnings without causing a corresponding reduction in the cost of producing milk. However, the normal relation is that higher yields mean lower feed prices locally.

RELATION TO PRACTICES.—The means of getting higher yields of crops would cover the whole field of agronomy and cannot be given in detail here. In general, they are: (1) choice of best suited crops, (2) choice of best cultural practices, (3) maintenance of fertility, and (4) using only the best soil for crops. In Table 50 higher crop indexes in the condensery group were associated with a lower percentage of total acres cultivated. This is a relationship which appeared in the other three years in every group except those on irrigated farms. The trend in the cream shippers group, Table 50, was distorted by the inclusion of inspected cream farms in the Calgary district which have low percentages of cultivated land. Due to local crop failure all of these farms had a low crop index in the year under review.

Land that is not cultivated is used for pasture. This is indicated in Table 51.

TABLE 51.—USE OF LAND NOT CROPPED, 1941-42.

Cows per farm	Number of farms	Crop land	Seeded pasture	Open (wild) pasture	Woods pastured	Woods not pastured	Yards roads and fences	Total acres
No.	No.	Ac.	Ac.	Ac.	Ac.	Ac.	Ac.	Ac.
Edmonton Churning Cream and Cheese Farms:—								
Less than 7....	28	190	10	29	70	1	6	306
7 to 9.....	26	184	9	36	46	17	6	298
10 to 12.....	16	195	14	55	39	9	5	317
13 to 15.....	13	297	34	123	84	29	6	573
16 or more....	9	330	24	87	74	5	7	527
Rosemary and Coaldale Cheese Farms:—								
Less than 5....	15	97	9	19	.....	7	2	134
5 to 7.....	21	131	6	44	.....	16	4	201
8 to 10.....	8	144	11	84	.....	164	3	406
11 or more....	6	126	14	133	.....	15	4	292

The tendency is to leave the roughest portions of the farm uncultivated and to seed down to a permanent pasture all those portions which are least desirable for cropping. It was noticeable that the main grass used in seeding down pasture was brome which is normally used only for permanent or semi-permanent pasture. The relationship then between high crop yield and a lower percentage of acres cropped was partly the result of more careful selection of land for cropping with the balance used for pasture. More pasture would also mean more winter feed to supply the stock raised on the pasture and hence more manure for less acres. This relationship can be made clearer by observing the effect of the concentration of livestock on farms. The concentration of livestock on farms as measured by the crop acres per animal unit is given in Table 52. Here it will be seen that the fewer crop acres per productive animal unit, the higher the crop yield. Since the greatest concentration is likely where there are the fewest crop acres, the effect in Table 52 is for the smaller size as measured by crop acres to offset the beneficial effect from the higher yields so that labour earnings show no distinct trend. Part of the relationship between fewer acres per farm and higher yields is probably due to the fact that where land is high in productivity less is required for a good sized farm business. Conversely, higher productivity will also mean a higher price and greater difficulty in acquiring large acreages.

TABLE 52.—THE EFFECT OF CONCENTRATION ON LIVESTOCK AS MEASURED BY CROP ACRES PER PRODUCTIVE ANIMAL UNIT, 1942-43

Crop Acres per Animal Unit	Number of farms	Average labour earnings	Average crop index	Crop acres per farm
	No.	\$	%	Ac.
Churning Cream Farms:—				
Less than 7 acres.....	14	1,186	112	158
7 or more acres.....	15	1,465	93	384
Condensery Patrons:—				
Less than 6.0 acres.....	19	861	102	117
6.0 to 7.9.....	11	426	99	281
8.0 or more.....	19	920	88	330

Labour

AMOUNTS REQUIRED.—The amounts of labour used on Alberta cream farms from 1939 to 1942 are shown in Table 53.

TABLE 53.—LABOUR USED ON ALBERTA CHURNING CREAM FARMS BY YEARS AND SIZE OF FARM, 1939 to 1942

—	Total acres	Number of farms	Man equivalent per farm ²	Months hired per farm	Days of day-labour per farm	Months unpaid family labour per farm ³	Live-stock units per man ⁴	Crop acres per man
	Ac.	No.						
1939-40.....	Under 300	55	1.8	1.9	16	8.2	13.6	57.2
	300 to 399	39	2.5	5.3	30	12.3	13.4	84.3
	400 and over	45	3.1	6.5	57	17.3	17.2	117.6
1940-41.....	Under 300	46	1.8	1.2	20	7.8	14.6	69.4
	300 to 399	30	2.0	2.5	25	8.6	18.8	103.5
	400 and over	34	2.7	5.5	44	13.0	19.3	129.1
1941-42.....	Under 300	37	1.8	0.7	11	8.1	13.1	60.9
	300 to 399	23	1.9	1.6	29	8.1	15.7	104.7
	400 and over	31	2.6	5.4	25	13.0	17.6	138.9

¹Patterson, H. L. and B. H. Kristjanson, "Alberta Dairy Farmers' Labour Problems", The Economic Annalist, page 21, May, 1943. ²Includes operator's time. ³Other than operator. ⁴Horses not included.

In order to appraise the amounts of the various types of labour, that is day, month, and year labour, these were reduced to a single figure—the man equivalent. There has been a marked decline in the manpower used during the first three years of the war. This decline seems to be common to all types of labour used. The average man equivalent is still around 2.0 men per farm.

LABOUR EFFICIENCY.—Measures.—Table 53 indicates that there is considerable variation in the amount accomplished per man as measured by livestock units per man or by crop acres per man. Part of this variation is due to the size of the farm. The larger the farm the greater the amount of labour that will be needed but the more that can be accomplished by each man. However the variation that occurs in the amount of work accomplished per man is much greater than that caused by size of farm alone. Many measures of labour efficiency are used. One could use livestock units per man or crop acres per man as in Table 53, but it will be observed that neither would serve alone as an operator might increase his animal units by cutting down his crop acres or increase his crop acres while cutting down on the livestock.

The desired measure should include not only the acres and animals involved but it should make allowance for the intensity of production. For example, a herd of cows running out most of the year and producing about 125 pounds of butterfat per cow presents quite a different labour problem from a herd given extra attention and producing over 300 pounds of butterfat per cow. The measure of labour efficiency then should be a measure of the physical volume of goods produced per man rather than the number of acres or cows looked after regardless of productivity.

Receipts per Man.—If all units of products are sold at the same price, then cash receipts would be a good measure of the physical volume of products produced and sold. While this condition is subject to price changes, the producers for any one market in any one year do tend to sell at about the same average price and when the farms are sorted by market groups, as in this study, the cash receipts per man is a fairly good measure of the physical volume sold off the farm per man employed. The effects of labour efficiency as measured by cash receipts per man are given in Table 54. As the cash receipts per man increased, the operator's labour earnings increased greatly and the cost per pound of butterfat decreased.

TABLE 54.—THE EFFECT OF LABOUR EFFICIENCY AS MEASURED BY CASH RECEIPTS PER MAN, 1941-42

Cash receipts per man	Number of farms	Average labour earnings	Cost per pound of butterfat	Average cash receipts per man	Average total capital
\$	No.	\$	¢	\$	\$
Edmonton Churning Cream and Cheese Farms:—					
Less than \$900.....	26	299	40	741	8,485
\$900 to \$1,299.....	24	458	39	1,122	11,363
\$1,300 to \$1,699.....	15	967	36	1,518	14,527
\$1,700 or more.....	27	1,606	33	2,150	16,048
Rosemary and Coaldale Cheese Milk Farms:—					
Less than \$1,400.....	22	596	34	1,010	4,759
\$1,400 or more.....	28	1,456	33	1,807	8,050

Hours per Pound of Butterfat.—Another way of measuring labour efficiency which has a more direct relation to the dairy is by the hours of man labour used to produce one pound of butterfat, as shown in Table 55 and Table 56.

TABLE 55.—THE EFFECT OF LABOUR EFFICIENCY AS MEASURED BY HOURS OF DAIRY CHORES PER POUND OF BUTTERFAT PRODUCED, 1941-42

Hours of dairy chores per pound of butterfat produced	Number of farms	Average labour earnings	Cost per pound butterfat	Average hours per pound butterfat	Cash receipts per man
Hrs.	No.	\$	¢	Hrs.	\$
Edmonton Churning Cream and Cheese Farms:—					
Less than .8.....	30	1,133	34	.7	1,472
.8 to 1.1.....	23	812	36	1.0	1,459
1.2 to 1.4.....	23	665	42	1.3	1,286
1.5 or more.....	16	540	42	1.6	1,231
Rosemary and Coaldale Cheese Milk Farms:—					
Less than .9.....	28	1,201	32	.7	1,587
.9 or more.....	22	920	36	1.0	1,290

TABLE 56.—THE EFFECT OF LABOUR EFFICIENCY AS MEASURED BY HOURS OF DAIRY CHORES PER POUND OF BUTTERFAT SOLD, 1942-43

Hours of chores per pound of butterfat	Number of farms	Average labour earnings	Cost per pound of butterfat	Cash receipts per man	Live-stock values as percentage of capital	Average total capital	Average hours of chores per pound of butterfat
Hr.	No.	\$	¢	\$	%	\$	Hr.
All Cream Farms:—							
Less than 1.3.....	26	1,533	.49	2,070	22	21,346	.93
1.3 or more.....	22	1,224	.71	1,730	19	16,595	1.57
All Condensery Farms:—							
Less than 1.0.....	21	1,212	.54	2,121	22	12,876	.75
1.0 or more.....	28	412	.77	1,387	20	12,914	1.46

Those who required the least time to produce one pound of butterfat had much the highest labour earnings and the lowest cost per pound of butterfat.

Ways to Improve.—High labour efficiency is to be found on farms having buildings conveniently laid out with feed stored where it is handy and with a system of driving right in for cleaning the barn. Also the fields must be well arranged and easy to reach from the buildings. Some farm operators, with a view to improving labour efficiency, have drawn a map of the farm to scale, then a plan of the buildings as they exist and last but not least a plan of the work to be done. In practically every case, such plans will reveal how time and effort may be wasted around the barn, going to fields by awkward ways or in shifting jobs too frequently. These causes of waste labour can be eliminated

by careful planning and rearranging fields and buildings.¹ Such changes would take time and thought but as Tables 55 and 56 indicate the increase of earnings due to high labour efficiency is worth the effort. Labour saving machinery is an advantage if there is enough work to do to justify the overhead cost and the extra time needed in caring for the machines.

Capital

CAPITAL REQUIRED.—The average total capital invested on processed milk farms included in this study for 1941-42 was \$13,135 for churning cream shippers, \$11,368 for cheese producers, \$5,954 and \$7,917 for Rosemary and Coaldale cheese milk shippers respectively. In the account year 1942-43 the condensery patrons had an average investment of \$13,172, or very similar to the farms shipping churning cream. Since churning cream farms average around two workers per farm, there is over \$6,000 of investment per worker on dry land farms. The irrigated land was in smaller farm businesses probably due to recent settlement of parts of the area and to the recent development of dairying in the district. The two cheese factories had been operating less than two years at the time of the study. The difficulty of securing the necessary capital is a real problem and, not infrequently, farm operators are handicapped by a lack of capital.

RELATION TO EARNINGS.—The importance of having enough capital to develop an efficient sized business is indicated in Table 57, giving the effect of size of business as measured by total capital invested. As the amount invested per farm increased the operator's labour earnings increased and labour efficiency as measured by cash receipts per man increased.

TABLE 57.—THE EFFECT OF SIZE OF BUSINESS AS MEASURED BY TOTAL CAPITAL, 1941-42

Total capital	Number of farms	Average labour earnings	Value of livestock as percentage of total capital	Cash receipts per man
\$	No.	\$	%	\$
Edmonton Churning Cream and Cheese Farms:—				
Less than \$6,000.....	35	640	21	1,179
\$6,000 to \$9,999.....	35	736	17	1,386
\$10,000 or more.....	22	1,293	13	1,694
Rosemary and Coaldale Cheese Milk Farms:—				
Less than \$6,000.....	24	998	30	1,312
\$6,000 or more.....	26	1,152	13	1,589

The ideal measure of efficiency in the use of capital would be based on the volume of products in relation to the capital invested. The measures used are based on cash receipts as a measure of volume of products in relation to dollars invested. Since agriculture is based on biologic processes that cannot be speeded up by mechanical means the rate of turnover on farm capital is relatively slow. The measure then used is the years required for cash receipts to equal investment. The effect of efficiency in the use of capital as measured by years required for cash receipts to equal capital is indicated in Table 58 for churning cream and cheese groups, and in Table 59 for condensery patrons.

¹ See Bulletin 503—"Labour saving through farm job analysis" University of Vermont Burlington Vermont 1943. by R. M. Carter.

TABLE 58.—THE EFFECT OF EFFICIENCY IN THE USE OF CAPITAL AS MEASURED BY YEARS REQUIRED BEFORE CASH RECEIPTS COULD EQUAL CAPITAL, 1941-42

Years required for cash receipts to equal capital	Number of farms	Average labour earnings	Percentage of capital in livestock	Crop index	Cash receipts per man	Average total capital
Yr.	No.	\$	%	%	\$	\$
Edmonton Churning Cream and Cheese Farms:—						
Less than 4.0.....	29	1,133	18	107	1,602	10,021
4.0 to 5.2.....	30	943	17	95	1,490	12,975
5.3 or more.....	33	469	14	97	1,087	14,346
Rosemary and Coaldale Cheese Milk Farms:—						
Less than 2.8.....	25	1,315	19	101	1,579	5,676
2.8 or more.....	25	840	17	94	1,333	7,528

TABLE 59.—THE EFFECT OF EFFICIENCY IN THE USE OF CAPITAL AS MEASURED BY YEARS FOR CASH RECEIPTS TO EQUAL TOTAL CAPITAL, 1942-43

Years for cash receipts to equal capital	Number of farms	Average labour earnings	Cost per pound of butterfat	Percentage of receipts from crops	Average crop index	Cash receipts per man	Livestock values as percentage of total capital	Average total capital	Hours of chores per pound of butterfat
Yr.	No.	\$	c.	%	%	\$	%	\$	Hr.
Cream Farms:—									
Less than 4.....	21	1,954	50.3	11	112	2,227	21	15,105	1.03
4 or more.....	27	954	63.4	9	102	1,671	20	22,329	1.28
Condensery Farms:—									
Less than 3.7.....	24	1,021	60.0	9	91	1,916	26	9,654	.90
3.7 or more.....	25	499	69.4	8	101	1,496	18	16,048	1.26

The churning cream farms requiring less than four years for cash receipts to equal capital had the highest operator's labour earnings and the lowest cost per pound of butterfat. The same was true for condensery farms requiring less than 3.7 years and irrigated cheese milk shipping farms requiring less than 2.8 years. This high efficiency in the use of capital must come from: (1) the choice of best paying enterprises; (2) a combination of enterprises that will utilize by-products, labour, untilled land, and buildings to the best advantage.

Size of Business

The size of the business has less effect on the earnings of processed milk farms than on whole milk and inspected cream farms. Furthermore, in the less favoured years or groups the usual effect of size was reversed—the larger the farm the lower the labour earnings. The reason for this reverse relation is that if the farm is not earning full hired man's wages for everyone employed on the farm, then the more of the labour that is hired at going wages, the less there will be left for the operator. Wages prevailing in 1939-40, for instance, would average \$25 per month of wages and about \$15 per month of board. This would mean about \$40 per month or \$480 per year. Since the average cream producer's labour earning was less than that amount it is not surprising that size of business showed little effect on labour earnings and that in the largest sizes where more labour would be employed at going rates labour earnings declined.

The measures of size available were limited by not having data on time spent on all enterprises. This makes it impossible to use the productive man work units as a measure of size. Crop acres are a fair measure of size on churning cream and condensery farms because practically all feed fed is home grown and crop acres are affected by the size of the livestock enterprises as well as by crops grown for sale. The effect of size as measured by crop acres for 1941-42 is shown in Table 60.

TABLE 60.—THE EFFECT OF SIZE OF BUSINESS AS MEASURED BY CROP ACRES, 1941-42

Crop acres per farm	Number of farms	Average labour earnings	Average crop acres	Crop acres as percentage of total acres	Percentage receipts from crops	Crop index	Cash receipts per man
Ac.	No.	\$	Ac.	%	%	%	\$
Edmonton Churning Cream and Cheese Farms:							
Less than 100.....	18	409	71	36	12	113	967
100 to 199.....	32	803	133	53	5	103	1,335
200 to 299.....	22	697	250	65	16	100	1,421
300 or more.....	20	1,411	451	67	14	81	1,781
Rosemary and Coaldale Cheese Farms:							
Less than 110.....	24	1,118	74	35	26	98	1,343
110 or more.....	26	1,041	166	71	33	97	1,561

While churning cream farms showed a strong relation between crop acres and labour earnings per farm, the Rosemary and Coaldale cheese milk farms showed very little effect from size as measured by crop acres and the farms with most crop acres had the lowest earnings.

The effect of size as measured by total acres is given in Table 61.

TABLE 61.—SIZE OF BUSINESS AS MEASURED BY TOTAL ACRES, 1941-42

Total acres per farm	Number of farms	Average labour earnings	Cost per pound of butterfat	Crop acres as percentage of total
Ac.	No.	\$	¢	%
Edmonton Churning Cream and Cheese Farms:				
Less than 170.....	27	625	36	60
170 to 329.....	31	705	36	61
330 to 489.....	18	948	40	63
490 or more.....	16	1,302	34	57
Rosemary and Coaldale Cheese Milk Farms:				
Less than 160.....	19	1,051	37	77
160 or more.....	31	1,094	31	50

The churning cream and cheese farms showed a more consistent relation between total acres and labour earnings than between crop acres and labour earnings. This is probably because crop acres do not give the best indication of livestock enterprises since the rough land pasture is quite an important part of the feed for cattle or sheep.

Adjusted acres give a more accurate picture of the livestock carrying capacity.¹ The effect of size as measured by adjusted acres is indicated in Table 62.

¹ Adjusted Acres—The adjusted acres is the sum of crop acres plus one-third of the wild open pasture and one-tenth of the bush pasture. On irrigated farms a further adjustment was made on uncultivated dry land to bring it to irrigated land equivalent.

TABLE 62.—THE EFFECT OF SIZE OF BUSINESS AS MEASURED BY ADJUSTED ACRES, 1942-43

Adjusted acres per farm	Number of farms	Average labour earnings	Percentage of receipts from crops	Crop index	Crop acres as percentage of total acres	Average crop acres
Ac.	No.	\$	%	%	%	Ac.
All Cream Farms:						
Less than 270.....	24	930	7	110	59	615
270 or more.....	24	1,853	13	102	61	397
All Condensery Farms:						
Less than 270.....	25	808	5	104	54	119
270 or more.....	24	700	12	87	63	359

The cream farms with the highest adjusted acreage had the highest labour earnings. However, on the condensery farms, the higher adjusted acreages were associated with lower labour earnings. During the year 1942-43 (Table 62) the condensery farms showed the same reaction to all measures of size of farm business, whether measured as acres of land, total capital invested, man equivalent per farm, or total animal units.

The effect of size as measured by total capital invested has already been shown in Table 57 under capital. It has shown the most consistent relationship to labour earnings and labour efficiency of any of the measures of size used in this study. Considerable care was used in arriving at property values and a file of recorded sales was kept as a guide in appraisal.

The effect of size as measured by total cash receipts is given in Table 63.

TABLE 63.—THE EFFECT OF SIZE OF BUSINESS AS MEASURED BY CASH RECEIPTS, 1941-42

Cash receipts per farm	Number of farms	Average labour earnings	Cost per pound of butterfat	Average crop acres	Average total acres	Crop acres as percentage of total acres	Cash receipts per man	Crop index
\$	No.	\$	¢	Ac.	Ac.	%	\$	%
Edmonton Churning Cream and Cheese Farms:								
Less than \$2,000	30	408	41	123	263	47	875	100
\$2,000 to \$2,999	29	592	36	168	280	60	1,385	94
\$3,000 or more..	33	1,431	35	349	534	65	1,836	104
Rosemary and Coaldale Cheese Farms:								
Less than \$2,000	22	714	39	97	244	40	1,141	87
\$2,000 or more..	28	1,364	31	142	210	68	1,704	105

Cash receipts is not a good measure of size alone. The labour earnings are closely related to cash receipts per farm as expenses per farm vary less than receipts.

The total animal units are a good measure of size on livestock farms. The effect of size as measured by total animal units is shown in Table 64.

TABLE 64.—THE EFFECT OF SIZE OF BUSINESS AS MEASURED BY TOTAL ANIMAL UNITS KEPT PER FARM, 1941-42

Total animal units	Number of farms	Average labour earnings	Average cost per pound butterfat	Average number of cows per farm	Feed cost per cow	Average total animal units	Average animal units of hogs
A.U.	No.	\$	¢	No.	\$	A.U.	A.U.
Edmonton Churning Cream and Cheese Farms:							
Less than 20.....	12	396	42.2	6	48	16	5
20 to 29.....	21	607	35.5	7	50	25	8
30 to 39.....	23	560	37.4	10	47	35	9
40 to 49.....	9	1,052	47.5	10	52	45	20
50 or more.....	27	1,362	34.1	13	47	60	24
Rosemary and Coaldale Cheese Farms:							
Less than 20.....	24	957	42.7	4	45	15	4
20 to 39.....	19	1,165	27.8	7	37	29	9
40 or more.....	7	1,254	28.7	11	33	49	15

The farms having the largest number of animal units also had the highest labour earnings.

One problem always raised when considering an increase in the size of the farm business is the labour required for an increase of crops or livestock. To check this problem the farms were sorted on the basis of the percentage of total labour that was hired. The percentage of the total labour that was hired was closely associated with the size of business as is indicated by the total animal units kept. The effect of percentage of labour hired is indicated in Table 65.

TABLE 65.—THE EFFECT OF PERCENTAGE OF LABOUR HIRED, 1941-42

Percentage labour hired	Number of farms	Average labour earnings	Average cost per pound of butterfat	Average number of cows per farm	Butterfat sold per cow	Feed cost per cow	Concentrates per Animal of dairy	Average total animal units	Average animal units of hogs
%	No.	\$	¢	No.	Lb.	\$	Lb.	A.U.	A.U.
Edmonton Churning Cream and Cheese Farms:									
None hired.....	33	568	36.9	10	187	41	857	32	9
1 to 19.....	37	744	38.8	10	188	51	1,141	35	12
20 or more.....	22	1,380	34.5	10	204	53	1,303	55	25
Rosemary and Coaldale Cheese Farms:									
None hired.....	14	659	34.6	5	181	32	440	19	5
1 to 9.....	19	1,080	30.8	8	222	36	1,149	28	8
10 or more.....	17	1,420	36.2	6	231	46	1,037	27	9

The farms that hired the most labour had the highest labour earnings. The efficiency of production as indicated by the butterfat sold per cow was highest on the farms that hired the most labour. While the effect of hiring labour is mostly due to the relationship to size of business, this does indicate that the necessity of hiring labour is not a serious handicap to increasing the size of the farm business.

While the size of the whole farm is important the side of the separate enterprises seems to be even more important. The effect of the size of the dairy herd is shown in Table 66.

TABLE 66.—THE EFFECT OF SIZE OF HERD ON COSTS AND RETURNS, 1941-42

Number of cows	Number of farms	Average labour earnings	Net cost per pound butterfat	Animal units of hogs per farm
No.	No.	\$	¢	A.U.
Edmonton Churning Cream and Cheese Farms:				
Less than 7.....	28	767	39.4	14
7 to 9.....	26	820	38.2	12
10 to 12.....	16	708	38.2	13
13 to 15.....	13	778	36.8	14
16 or more.....	9	1,377	32.5	14
Rosemary and Coaldale Cheese Farms:				
Less than 5.....	15	886	44.9	6
5 to 7.....	21	1,037	35.5	8
8 to 10.....	8	1,267	24.3	8
11 or more.....	6	1,446	30.1	11

The size of the hog enterprise as measured by animal units of hogs is given in Table 67.

TABLE 67.—THE RELATION OF SIZE OF HOG ENTERPRISE TO VARIOUS FACTORS, 1941-42

Number of animal units of hogs	Number of farms	Average labour earnings	Average number of cows per farm	Percentage of labour hired
A.U.	No.	\$	No.	%
Edmonton Churning Cream and Cheese Farms:				
No hogs.....	6	204	14	3
1 to 4.....	15	219	9	4
5 to 9.....	19	599	10	6
10 to 14.....	17	902	8	9
15 to 19.....	12	742	11	13
20 or more.....	23	1,578	10	25
Rosemary and Coaldale Cheese Farms:				
No hogs.....	4	582	6	4
1 to 4.....	10	927	5	7
5 to 9.....	25	1,065	6	12
10 or more.....	21	1,354	8	15

In both dairy cattle and hogs the largest herds are associated with the highest average labour earnings. As the number of cows increased the cost per pound of butterfat decreased. However, the advance in labour earnings with increased size of herd was not uniform or rapid until a fairly large size of herd had been reached. In some groups there was a decrease in earnings with the first increase in size of herd and then a rapid increase occurs with additional increases in the size of herd. This relationship was shown for 1939-40 in Chart 1. Decrease in income with the first increase of size and then a rapid increase with further increases of size occurs where other enterprises are just as profitable or more profitable than the dairy herd. In an area with good alternative enterprises an operator may have no receipts from one enterprise and yet derive a moderately good earning from other enterprises. Then when an enterprise involves additional outlays of capital and labour, but the enterprise is too small to make efficient use of the added capital and labour, it will detract from earnings rather than add to them. On the other hand if the added enterprise is large

enough to be efficient it will add to the earnings very rapidly. This relationship has occurred every year in association with the size of at least one of the enterprises. At other times it appears that size of enterprise has little effect on returns until a large unit is developed. On some large farms there are so many enterprises that none of them are up to the optimum size. On such farms the usual relationships of size with high labour earnings and high labour efficiency are seldom found.

Where one enterprise is outstanding as a best paying enterprise it will usually show a continuously direct relationship between size of enterprise and labour earnings.

Combination of Enterprises

BEST PAYING ENTERPRISES.—The choice of the best paying enterprises is something for which every operator strives, but his ability to choose correctly would be greatly aided if cost accounts were kept on all farm enterprises, by enough farmers to give a representative picture of the returns per hour of labour from each enterprise. Measuring the percentage of labour would involve the classification of all enterprises according to the returns per hour of labour. This cannot be done without complete cost accounts. Some information may be gained, however, from the effects on labour earnings of various percentages of receipts from particular enterprises. The effect of growing crops for sale as measured by the percentage of receipts from crops is given in Tables 68 and 69.

TABLE 68.—COMBINATION OF ENTERPRISES: EFFECT OF GROWING CROPS FOR SALE, 1941-42

Percentage receipts from crops	Number of farms	Average labour earnings	Crop acres as percentage of total acres	Percentage receipts from crops	Crop index	Average crop acres
%	No.	\$	%	%	%	Ac.
Edmonton Churning Cream and Cheese Farms:						
No receipts.....	21	445	53	89	159	
1 to 10.....	34	870	61	4	103	170
11 to 20.....	20	1,118	58	15	96	340
21 or more.....	17	902	68	33	109	243
Rosemary and Coaldale Cheese milk Farms:						
Less than 30.....	24	919	39	14	91	116
30 or more.....	26	1,224	80	44	103	128

TABLE 69.—THE EFFECT OF CONCENTRATION ON CROPS, 1942-43

Percentage of receipts from crops	Number of farms	Average labour earnings	Cost per pound of butterfat	Percentage of receipts from crops	Crop index	Crop acres as percentage of total acres	Average crop acres
%	No.	\$	¢	%	%	%	Ac.
All Cream Farms:—							
Less than 10.....	23	1,134	57·7	3	108	49	217
10 or more.....	20	1,752	56·2	21	104	76	360
All Condensery Farms:—							
Less than 8.....	26	784	61·8	2	98	55	192
8 or more.....	23	722	66·6	15	94	66	287

It will be seen in the above tables that the highest percentage of receipts from crops is associated with higher labour earnings in the churning cream and cheese groups but in the condensery group there was no increase of earnings for the group having the highest percentage of receipts from crops. It is also

noticeable that there was less effect in the churning cream group in 1942-43 than in 1941-42. Cash crops are a good enterprise in areas where the land is suited and when the prices are at parity with those of other available enterprises. However, in some areas and at certain prices cash crops do not provide the best paying enterprise.

The effect of concentration on the dairy as a source of income is shown in Table 70.

TABLE 70.—COMBINATION OF ENTERPRISES: EFFECT OF CONCENTRATION ON DAIRY ENTERPRISES, 1941-42

Percentage receipts from dairy	Number of farms	Average labour earnings	Cost per pound of butterfat	Cash receipts per man	Crop acres as percentage of total acres	Crop index	Average crop acres per farm
%	No.	\$	¢	\$	%	%	Ac.
Edmonton Churning Cream and Cheese Farms:—							
Less than 20.....	23	1,265	39	1,838	65	109	318
20 to 29.....	20	1,098	38	1,524	65	101	240
30 to 39.....	20	733	34	1,315	63	95	173
40 or more.....	29	376	37	964	48	94	154
Rosemary and Coaldale Cheese Farms:—							
Less than 25.....	23	1,286	36	1,695	77	99	140
25 or more.....	27	900	31	1,249	41	96	106

As the percentage of receipts from the dairy increased, crop acres per farm decreased as also did the crop index and the percentage of cultivated land. This suggests that dairying tends to be concentrated on the land with rougher topography or with the least tillable land. In other words it becomes a problem of land use as well as a choice of enterprise. Another factor to consider is that dairying represented quite high percentages of the receipts in some of the groups shown and farm management workers have long known that while dairying fits in well with other enterprises it seldom gives a good utilization of labour or by-products by itself. When the farms are sorted on the number of cows in the dairy herd the earnings increase with the size of the herd. Therefore, the only conclusion that can be drawn is that dairying should not be the sole enterprise, but should be combined on big farms with enterprises paying high returns per hour of labour but which do not provide for a full utilization of labour or by-products alone.

The third main enterprise found on the dairy farms in Alberta was hog raising. The effect of concentration on hog raising is shown in Tables 71 and 72.

TABLE 71.—COMBINATION OF ENTERPRISES: EFFECT OF CONCENTRATION ON HOGS, 1942-41

Percentage Receipts from hogs	Number of farms	Average labour earnings	Cash receipts per man	Crop acres as percentage of total acres	Crop index	Average crop acres
%	No.	\$	\$	%	%	Ac.
Edmonton Churning Cream and Cheese Farms:—						
Less than 20.....	24	309	1,038	56	94	200
20 to 39.....	34	1,057	1,372	61	101	229
40 or more.....	34	978	1,631	61	103	220
Rosemary and Coaldale Cheese Milk Farms:—						
Less than 20.....	22	1,223	1,494	44	99	118
20 or more.....	28	964	1,427	65	93	125

TABLE 72.—THE EFFECT OF CONCENTRATION ON HOGS, 1942-43

Percentage of receipts from hogs	Number of farms	Average labour earnings	Cost per pound of butterfat	Percentage of receipts from crops	Cash receipts per man	Crop acres as percentage of total acres	Average crop acres
%	No.	\$	¢	%	\$	%	Ac.
All Cream Farms:—							
Less than 30.....	19	999	56	6	1,970	49	281
30 or more.....	29	1,649	58	6	1,881	70	273
All Condensery Farms:—							
Less than 20.....	22	928	61	11	1,847	55	206
20 or more.....	27	613	67	6	1,584	64	262

There seems to be a distinct advantage in keeping hogs on the cream farms although this advantage was less apparent on farms having over 40 per cent of their receipts from hogs. This also was indicated in a similar study in previous years so that it can be said that while hogs are a good paying enterprise on cream farms, the best results are obtained where they are combined with other enterprises. On cheese farms and condensery farms, however, an increase in percentage receipts from hogs results in a decrease of labour earnings. This was largely because the increase in percentage of hogs was accompanied by a decrease in other enterprises. This is indicated by the fact that the crop acres did not increase. In other words where the percentage of receipts from hogs increased, total receipts declined or a small size of business prevailed.

In all groups, the highest earnings were obtained where the most hogs were kept, so that the only conclusion that can be reached is that hogs are usually a paying enterprise for most Alberta conditions found within the area of this study and under the price conditions prevailing during the study, provided that feed crops are well adapted to the area and large enough to provide the feed economically.

Beef cattle were important on some farms. In each year of the study the gross returns per animal unit for each class of stock were calculated. The returns per animal unit from dairy cattle ran from \$15 to \$32 more than the annual gross return per animal unit of beef cattle. The dairy would involve more work per animal unit but this work would come partly during the slack seasons for other enterprises. Thus where the conditions were suitable for dairy, for example, where the pasture was close to the buildings and where the wild hay or other winter feed raised was in balance with the pasture available, the cattle were kept primarily for their dairy production. Where pasture land was too remote from the buildings, the tendency was to run a beef and dry cow herd on it. Where there was an excess of roughage over the requirements of animals that could be pastured in summer, there was a tendency to develop winter feedlots and buy feeders. These conditions did not exist on enough farms to give a reliable average based on beef production.

Large poultry enterprises were found on a few farms, particularly those close to a large city market or where road conditions were favourable to regular delivery. Sheep were usually found only in the transition between the grey and black soil regions where there was considerable bush clearing to be done. Here the sheep ranged over the bush and cut-over land and kept the second growth down until the operator could get around to breaking the land. In addition they were returning some income from very rough feed and as they

did not involve much labour they left the operator free to get on with the work of clearing and breaking.

COMBINATION OF ENTERPRISES.—It has been indicated that no one enterprise alone gives the best combination for a utilization of labour, by-products, buildings, and untillable land. Crop production is very seasonal in nature. It requires much labour in good weather and very little in wet weather. It requires a large amount of labour in summer and practically none in winter. The sort on percentage receipts from crops indicates that in spite of their seasonal nature, they contribute substantially to income which means that the return per hour of labour must be relatively high since they are seasonal and do not require many hours of labour when compared with dairy cattle. Dairying is an all-year proposition with the heaviest labour requirement coming in winter. As may be seen in the financial summary, Table 43, the return per hour of labour from churning cream, cheese, and condensery milk is low but the dairy can provide work all year and is largely independent of the weather. Thus these types of dairying fit in well as a second enterprise but it is still desirable to have a large portion of the receipts from other enterprises that would give a higher return per hour of labour. The effect of the dairy in creating steady employment through the year may be seen in Chart 1, Part I. The by-products of crops, such as straw and screenings or low grade grain, can only be utilized to best advantage through livestock. The combinations most commonly found in the Edmonton cream and cheese areas were dairying with hogs and crops for sale.

Although most of the farms in the churning cream and cheese areas used cattle that showed several crosses of the dual purpose breeds, that is Shorthorns and Red Polls, the tendency was either to treat the cattle as a straight dairy herd with nearly all calves sold for veal or else to set up a separate herd where the cows were not milked at all. The animals kept, by age and sex, are given in Table 73.

TABLE 73.—AVERAGE NUMBER OF DAIRY CATTLE BY MATURITY AND SEX, PER FARM

District	Number of farms	Cows	Calves	Heifers over one year	Steers over one year	Bulls
	No.	No.	No.	No.	No.	No.
Edmonton whole milk.....	42	21	7.17	5.62	.02	1.05
Edmonton inspected cream.....	43	17	7.62	5.97	1.03	1.02
Edmonton churning cream.....	72	9	5.86	2.95	.79	.73
Edmonton cheese.....	20	13	6.80	4.16	.45	.62
Calgary whole milk.....	35	31	10.30	9.88	.....	1.80
Lethbridge whole milk.....	8	43	12.70	14.25	.12	1.56
Calgary inspected cream.....	12	16	5.32	6.16	.21	.79
Rosemary and Coaldale cheese farms...	50	7	4.01	2.12	.71	.29

While the breeds kept by the churning cream and cheese milk herds run more to the dual purpose type than those kept by the whole milk shippers, it is plain that they handle the herds in much the same way. The average number of steers over one year old in any of the groups would not be enough to keep the home supplied with beef. The tendency to raise the steers from cows that were milked was most common in small herds that were largely required to supply the house needs. In larger herds the tendency was to run beef and dairy cows as two separate herds or to just treat them as straight dairy herds. The decision to run a beef herd seemed to depend on the amount of pasture at considerable distance from the buildings. The effect of a crop livestock combination on the rate of turnover on capital is shown in Table 74.

TABLE 74.—THE EFFECT OF CAPITAL IN LIVESTOCK, 1941-42

Percentage of capital in livestock	Number of farms	Average labour earnings	Average total capital	Average years for cash receipts to equal capital
	No.	\$	\$	Yr.
Edmonton Churning Cream and Cheese Farms:—				
Less than 13.....	24	976	17,379	6.1
13 to 18.....	29	770	12,103	5.0
19 to 24.....	26	898	10,665	4.2
25 or more.....	13	579	7,623	4.5
Rosemary and Coaldale Cheese Farms:—				
Less than 20.....	25	1,192	8,500	3.1
20 or more.....	25	964	4,704	3.0

While the highest percentage of capital invested in livestock was associated with the smallest farms as measured by capital investment and hence with lowest labour earnings, the years required for cash receipts to equal capital decreased as the percentage of capital in livestock increased.

It may be observed from Tables 68 and 69 that a higher percentage of receipts from crops is associated with higher crop acres and a higher percentage of total land cultivated. In Table 70 it may be seen that a higher percentage of receipts from the dairy is associated with fewer crop acres and a lower percentage of the total acres cultivated. The balance between crops and dairying is determined to some extent by the percentage of land suited to cultivation. Hogs seem to be neutral in relationship to crop acres. Hog production seems to be determined more by the relative suitability of the district for high grade wheat or for coarse grains.

The only situation in which the highest earnings would be secured from one enterprise alone would be where one enterprise was so outstanding as a best paying enterprise that this advantage would overcome the advantages of a combination of enterprises. This condition does exist in Alberta where soil and climatic conditions give special advantage to one crop, as in some of the wheat growing areas; or, where the land is not suited to cultivation and only animals that live largely on pasture or roughage can utilize it to advantage as in some ranch areas. None of the churning cream or cheese areas seemed to fulfil either of the conditions favouring specialization on a single enterprise. Another factor tending towards specialization is the advantage to be gained from the use of modern labour saving machinery. When the cream, cheese, and condensery farms were sorted on the percentage of investment in equipment, no increase in labour earnings or in labour efficiency was found in conjunction with higher percentage invested in equipment. One reason for this may be that farmers are now hiring machines from neighbours who do not have full use for them at home and also joint ownership of larger machines is rather common, particularly among families where all are farming in the same district.

Combined Effect of Efficiency Factors

Efficient use of each of the factors that have been discussed earlier has been shown to result in greater earnings. The maximum effect on earnings is obtained where all factors are used efficiently. The farms were sorted each year on the number of factors that were average or better and the results for 1941-42 are shown in Table 75:

TABLE 75.—CUMULATIVE EFFECT OF FIVE FARM MANAGEMENT FACTORS ¹

Number of factors high	42 Whole milk farms		43 Inspected cream farms		72 Churning cream farms		20 Cheese milk farms	
	Number of farms	Average labour earnings	Number of farms	Average labour earnings	Number of farms	Average labour earnings	Number of farms	Average labour earnings
	No.	\$	No.	\$	No.	\$	No.	\$
0.....	3	-54 ²	.....	.....	3	354	3	-2 ²
1.....	6	623	11	407	17	362	5	85
2.....	13	729	11	442	13	494	4	453
3.....	8	1,489	11	1,787	23	1,074	7	731
4.....	10	1,854	8	2,118	14	1,476	.....	.....
5.....	2	2,318	2	2,711	2	2,393	1	5,508

¹ Factors:

1. Livestock Efficiency
2. Crop Efficiency
3. Labour Efficiency
4. Capital Efficiency
5. Size of Business

Measure of Efficiency Used:

Butterfat per Cow
 Crop Yield Index
 Receipts per Man
 Years for Cash Receipts to Equal Capital Crop Acres

² Minus signs indicate loss.

It will be noted that labour earnings vary directly with the number of factors in which a farm is operating above average efficiency. It will be seen that few farms are above average in all five factors. Average is a comparatively low standard to set as approximately half of the farms are average or higher on any one factor. It is surprising then that more do not reach that standard in all factors. So far as the individual farms are concerned, there is no assurance from one factor being high that any other factor will be also. Even those farms that are average or better on all factors are not as high as they could be on all factors. Thus there is always some margin for improvement. One variation to be found in the relationship of the number of factors high and labour earnings is in the effect of size when conditions are unfavourable. This is indicated in Table 76 giving the effect of having factors high in 1942-43.

TABLE 76.—THE CUMULATIVE EFFECT OF FACTORS AFFECTING INCOME, 1942-43

	47 Cream farms		49 Condensery shippers	
	Number of farms	Average labour earnings	Number of farms	Average labour earnings
	No.	\$	No.	\$
Number of Factors Average or Higher:—				
0.....	6	506	5	237
1.....	7	-698	7	135
2.....	9	1,350	13	59
3.....	18	2,082	14	1,465
4.....	7	2,090	10	1,512
5.....	.....	.....	.....	.....
High in size and low in other four factors.....	1	-6,724	3	-139
High in size and one other factor, very low in other three.....	.....	.....	5	-609
Average of Five Factors:				
Livestock: Butterfat per Cow.....	Lb.	225	.....	237
Crops: Crop Yield Index.....	%	106	.....	96
Labour: Cash Receipts per Man.....	\$	1,914	.....	1,702
Capital: Years for Cash Receipts to Equal Capital...	Yr.	4.4	.....	3.8
Size: Crop Acres.....	Ac.	284	.....	237

Size it will be noted is a double action factor. When all other factors are favourable, size of business becomes the most important way of increasing earnings, but when prices are low or other factors very unfavourable a large sized farm will have a large loss.

One of the social problems of agriculture is that one farm business does not usually last longer than the active lifetime of one man and then another operator starts in, probably short of both capital and experience. Under these conditions it is inevitable that many will find themselves in the unenviable position of operating a farm below average in all factors of production and the necessity of starting the slow road to improvement handicapped by the continuous lack of funds with which to make improvements. However, most of the farms are only low in two or three factors and it is important that these weak spots shall be located as soon as possible and improvements started, because some improvements may require several years. Farm accounts will indicate where such improvements should be made. An operator who does not keep and summarize accounts is working blindly and may continue for years without knowing the weak spots or improving his position.

PART III

TYPES OF DAIRY FARMS IN THE MAIN AREAS OF PRODUCTION

Introduction

The biologic processes involved in milk production are similar in principle everywhere. For this reason many are inclined to expect that the methods by which these processes are aided will be similar on all farms. However, on dairy farms in different market groups there are many differences in the aids given to the biologic processes. More specifically there are important differences in the quantity and quality of feed used, in the shelter, and in the methods by which the animals are provided with these necessities. These variations are to some extent correlated with conditions in the area in which the production occurs and to some extent with the type of market provided. The understanding of dairy production in Alberta will be greatly improved if these variations and the procedures characteristic of different areas are known.

The Requirements of Dairy Production

PHYSICAL REQUIREMENTS.—The pounds of feed, in addition to pasture, required to produce 100 pounds of market milk in each of the main market groups are given in Table 77. The table is based on milk marketed. Milk fed to livestock is excluded. Furthermore, the amounts of feeds fed are calculated on a herd basis and include feed fed to heifers being raised. Consequently, the figures given in the table would not be comparable with any standards set on the basis of requirements of milking cows alone. The reason for using the herd basis is that the great majority of Alberta dairy farms deal with the herd as a unit. The animals are fed in the same barn from the same feed storage and the feed required is calculated for the herd, rather than for milk cows plus feed for young stock. It would therefore be very difficult to determine separately the quantities fed to each age of dairy cattle. The methods used in dealing with young stock when calculating costs, are given in the next section.

TABLE 77.—PHYSICAL REQUIREMENTS TO PRODUCE FOR MARKET¹ 100 POUNDS OF 3·6 TEST MILK BY GROUPS AND YEARS

	Edmonton whole milk shippers		Lethbridge whole milk shippers		Calgary whole milk shippers		Churning cream shippers	Condensery shippers
	1941-42	1942-43 ²	1941-42	1942-43	1941-42	1942-43	1942-43	1942-43
Number of farms.....No.	42	15	8	7	35	31	30	49
Concentrates ³.....Lb.	46·6	45·0	56·0	61·0	49·4	50·0	41·0	46·0
Alfalfa hay.....Lb.	96·2	38·0	77·0	76·0	88·6	16·0	23·0	18·0
Wild hay.....Lb.		·5				10·0	10·0	15·0
Oat bundles and tame hay.....Lb.		72·0	10·0	4·0		72·0	117·0	90·0
Straw.....Lb.	3·6	1·0	22·0	8·0	9·5	2·0	8·0	1·0
Beet tops (dry weight).....Lb.			4·0	1·0				
Total dry roughage.....Lb.	99·8	111·5	113·0	89·0	98·1	100·0	158·0	126·0
Succulents.....Lb.	1·8	2·0	61·0	61·0	1·6	·2	21·0	6·0
Man labour on chores.....Hr.	2·6	2·3	2·5	2·0	2·5	2·5	4·6	4·0

¹ Milk fed to calves not included.² Only a small group was carried in 1942-43 and this was not as representative of all the shippers as in 1941-42.³ Concentrates mean mostly oats and barley except in the Lethbridge area. There considerable quantities of beet pulp and brewers' grains were fed, and these were reduced to their dry weight equivalent by use of average figures in Morrison's "Feeds and Feeding", 20th Edition.

Table 77 shows the pounds of feed required to produce 100 pounds of milk on different types of farms. The variations in quantity of feed that do appear are mostly the result of varying production per cow and quality of roughage fed. In the Lethbridge whole milk area there were two hail storms in 1941 and as a result they fed less grain and more green feed and straw than was the case in 1942-43.

In Table 77 it is indicated that fairly heavy quantities of concentrates are fed in Alberta. This is also indicated in Table 78 giving the average concentrates fed per dairy animal unit in the 1942-43 account year. One reason for the generally heavy feeding of concentrates is that northern Alberta is the centre of lowest priced grain in Canada. This is primarily due to freight and handling costs to world markets and the price tends to rise as the seaboard is approached either east or west. Roughage prices, however, seem to be very similar in price to those in other parts of Canada. This latter may be due to the fact that hand labour enters so largely into the cost of hay production and farm wages tend to be at least as high on Alberta farms as elsewhere.

TABLE 78.—AVERAGE CONCENTRATES FED PER DAIRY ANIMAL UNIT, 1942-43

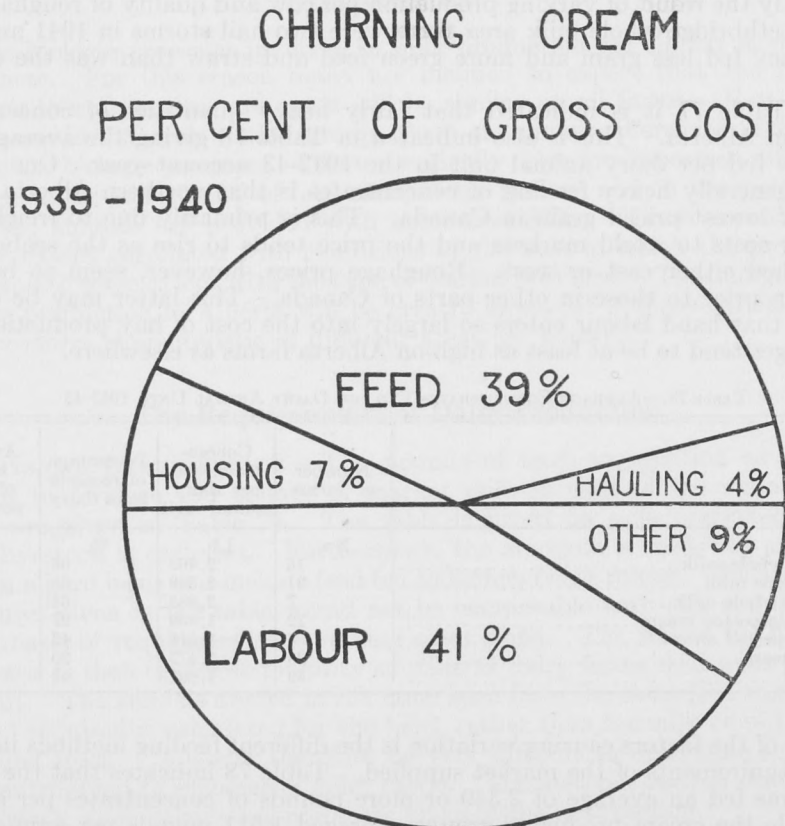
	Number of farms	Concentrates fed per dairy animal unit	Percentage of receipts from dairy	Average number of cows per farm
	No.	Lb.	%	No.
Edmonton whole milk.....	15	2,402	63	23
Calgary whole milk.....	31	2,349	68	33
Lethbridge whole milk.....	7	2,885	64	48
Edmonton inspected cream.....	12	1,450	27	14
Calgary inspected cream.....	6	1,511	42	19
Churning cream.....	30	1,472	30	11
Condensery.....	49	1,892	42	12

One of the factors causing variation is the different feeding methods induced by the requirements of the market supplied. Table 78 indicates that the whole milk farms fed an average of 2,349 or more pounds of concentrates per animal unit while the cream producing groups averaged 1,511 pounds per animal unit

or less. The condensery farms are intermediate between cream and whole milk producers both in pounds of concentrates fed per animal unit and in percentage of receipts from the dairy. The larger quantity of grain fed by whole milk shippers is largely due to the necessity of delivering the daily quota of milk the whole year around. It is something of a problem to keep cows milking as well in fall and winter as they do on lush pastures. It is seldom that anyone achieves that goal, but even coming close to it requires that considerable quantities of concentrates be fed. The whole milk men also get increased production of milk by using a higher proportion of cows from the specialized dairy breeds, by feeding a better quality of roughage, and by more attention to breeding and selection. Since they receive a higher percentage of their receipts from the dairy they have more to gain from any attention given to the dairy.

The extra time on chores indicated in Table 77 to be required by the churning cream and condensery shippers was largely the result of smaller herds, lower production per cow, and a relatively small number of milking machines when compared with those in use on the whole milk farms.

REQUIREMENTS AS PERCENTAGE OF GROSS COST.—The actual costs of milk production help to describe the process of production because they bring all the requirements to a common denominator, namely the cost in terms of dollars. The importance of each item can then be appraised by considering the proportion of total cost that each item represents. The main items of cost as percentage of total cost, 1942-43, are presented in Table 79. The percentage distribution of gross costs for churning cream farms, 1939-40, is illustrated in Chart 3.



The gross cost is used as total cost and is always taken as 100 per cent. The income received from the sale of old cows and veal calves is treated as a credit to the dairy enterprise and deducted from gross costs to obtain the net cost. Other sources of income to the dairy which are credited are skim milk fed to other than dairy calves and prize money. These credit items appear in Table 79 as a percentage of gross cost and after deducting them the remainder is known as net cost or the cost which is considered directly attributable to milk production. It may be observed that the credit items are a much higher percentage of gross cost in the case of the cream farms than in any of the farms selling milk as whole milk or for condensing. The cream producers had lower gross costs and the same credits would equal a higher percentage. In addition to this skim-milk was available. Where skim-milk was fed to calves it resulted in increased dairy livestock sales and herd increase. Where skim-milk was fed to other than dairy stock, it was valued and credited directly to the dairy herd.

TABLE 79.—PERCENTAGE DISTRIBUTION OF GROSS COSTS OF MILK PRODUCTION ON FARMS BY TYPE OF MARKET, 1942-43

Items	Edmon- ton whole milk	Edmon- ton inspected cream	Churning cream	Leth- bridge whole milk	Calgary whole milk	Calgary inspected cream	Red Deer conden- sery
	%	%	%	%	%	%	%
Concentrates fed.....	18.1	14.7	14.3	18.4	20.5	14.0	16.8
Dry roughage fed.....	19.5	17.2	17.3	18.7	14.8	17.2	15.7
Other feeds (including pasture).....	4.8	6.3	5.5	11.7	4.3	5.0	4.6
Total feeds.....	42.4	38.2	37.2	48.8	39.6	36.2	37.1
Labour.....	30.1	40.9	43.3	27.4	33.3	44.4	43.8
Use of buildings.....	5.5	5.6	4.8	4.1	4.6	4.7	3.9
Marketing.....	8.2	4.3	3.7	8.7	8.3	3.7	3.8
All other.....	13.8	11.0	11.0	11.0	14.2	11.0	11.4
Gross cost.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Credit items.....	9.1	30.0	31.0	12.2	13.6	20.7	16.0
Net cost.....	90.9	70.0	69.0	87.8	86.4	79.3	84.0

In comparing the percentages as between groups it may be noted that the highly variable percentages are those representing feeds, labour and marketing. The use of buildings and the items grouped under "All Other" costs are remarkably similar in all groups. Stated differently it is for the physical requirements of dairy production that the dollar value varies most between different types of dairy farms.

METHODS OF MEETING A FEED SHORTAGE.—When a shortage of fodder occurs, some adjustment in the feeding practice is necessary. This adjustment is similar in all groups of shippers so far as roughage is concerned. When good roughage such as alfalfa hay is scarce more lower grade roughage such as straw is used.

There is another type of adjustment, used by churning cream men, but not by whole milk shippers, and that is to reduce the number of cows fed. This is a simple adjustment for a cream shipper or even a condensery shipper to make. However a whole milk shipper has to think about his quota for delivery. In fact the quota was largely developed to prevent that type of adjustment, since it would mean that in times of feed shortage there would be an inadequate supply of whole milk for the city consumers. On the other hand butter can be shipped long distances if necessary. When roughage is scarce or poor, whole milk men are likely to feed more grain to make up for any deficiency in the quantity or quality of the roughage fed.

TYPE OF STOCK KEPT.—In general, the more the farms depend on the dairy as the main source of income the greater was the tendency to keep cows of the specialized dairy breeds. The whole milk areas tend to use Holsteins, Jerseys, and Ayrshires, in the order named. In the churning cream and cheese areas many of the herds were of mixed breeding and very difficult to classify. In these areas in addition to the dairy breeds there was considerable evidence of dual purpose breeds like Shorthorns and Red Polls, with some cases of straight beef breeds like Herefords or Aberdeen Angus. However on the farms studied the practice was to treat the herds as dairy herds, that is the cows were all milked and bull calves were usually sold for veal, being raised to yearlings or older only where there was an abundance of pasture distant from the buildings.

The Intensity of Dairy Production

VARIATION BY SOIL ZONES.—The intensity of dairy production varies considerably in the various generalized soil zones of Alberta.¹ This variation is indicated in Table 80 which gives the number of factories and the production of churning cream, cheese, and concentrated milk for each zone. From this table it is evident that the black soil zone possessed about 59 per cent of the creameries and produced about 55 per cent of the butterfat for creamery butter in 1942. It also had 50 per cent of the cheese factories and supplied 54 per cent of the provincial cheese production. The black soil produced 98 per cent of the concentrated milk.

The irrigation projects in Alberta are all located in the brown soils. Since considerable dairying is done in the irrigated area, dairy production originating on irrigated land should be deducted from that credited to the brown soil zones to get a true comparison with the black and grey zones. Thus the tendency to concentrate the dairying in the soil zones with greatest moisture supply is even greater than Table 80 would indicate.

Due to their heavy tree cover and special soil problems, the areas comprising grey soils were settled later and developed more slowly than the other soil zones. However, the most rapid development in dairying in Alberta in recent years has taken place on the grey soils, close to the black soil zones. In part this development has been influenced by factories located in the black soil areas.

The pattern of production, then, is that the black soils provide over half of the dairy products of Alberta, with the dark brown and grey soils secondary and the light brown soils of still less importance in dairy production. The relationship between soil zones and dairy production is so marked that any facts having a bearing on it will be a help in understanding the basis for dairy production in Alberta.

EFFECT OF SOIL MOISTURE.—The generalized soil zones of Alberta are primarily soil moisture zones. That is, the differences in soil development are mostly due to differences in rainfall or evaporation. It is obvious that these differences of soil moisture have a close relation to intensity of dairy production.

Dairying is not usually well developed in pioneer areas because of the high investment required for buildings, equipment and dairy herd. This has prevented the grey soil zone from attaining the fullest development of dairying. The tree cover in this area has meant later settlement and slower development than for the remainder of the province. The grey soils have the highest average natural soil moisture of the generalized soil zones and it is significant that the most rapid increases in dairy production in recent years have come from these grey soils and from the irrigated areas. The largest proportion of dairy products comes from the black soil zone, which is the highest in soil moisture of the soil zones that are most completely developed agriculturally.

¹ See map of Alberta giving the generalized soil zones at Page 14.

TABLE 80. DAIRY PRODUCTION IN THE VARIOUS SOIL ZONES IN ALBERTA, 1942¹

	Product	Estimated production ²	Pounds manufactured	Value
		Lb.	Lb.	\$
Black Soil Zone:—				
56 creameries.....	butter	20,396,644	24,733,761	7,873,856
10 cheese factories.....	cheese		2,099,780	446,422
7 concentrated milk plants.....			12,567,254	956,753
Dark Brown Soil Zone:—				
28 creameries.....	butter	9,553,061	9,810,885	3,183,161
7 cheese factories.....	cheese		1,531,763	340,630
1 concentrated milk plant.....			127,000	13,029
Light Brown Soil Zone:—				
3 creameries.....	butter	2,039,460	995,440	317,714
1 cheese factory.....	cheese		234,574	47,595
1 concentrated milk plant.....			38,705	3,096
Grey Wooded Soil Zone:—				
7 creameries.....	butter	4,996,744	1,445,823	460,760
2 cheese factories.....	cheese		42,428	8,817
GRAND TOTALS:—				
94 creameries.....	butter		36,985,909	11,835,491
20 cheese factories.....	cheese		3,908,545	843,464
9 concentrated milk plants.....			12,732,959	972,878

¹ Data from Dairy Commissioner's Office, Provincial Department of Agriculture, Edmonton, Alberta.

² When compiling statistics for the various soil zones, it was noted that certain creameries drew their cream supply from two or more soil zones. After careful study of the maps, keeping in mind the production policy at the various creameries, estimates were made of butter produced in the various soil zones as listed.

The receipts per animal unit are greater from dairy cows than from beef. During the 1940-41 crop year the churning cream farms studied received over \$70 of dairy returns per cow, on the average whereas the returns per beef cow on ranches studied in the same year¹ was about one-half of that. Where the conditions are suitable for dairying, it usually gets the preference over beef production. However, the conditions suitable for dairying are much more restricted than for beef raising. For example, the dairy cows are usually milked twice per day and their pasture must be relatively close to the barn and water supply. This limits pasture that can be used on any one farm to those areas within a short distance of the buildings. While no rule can be laid down it is significant that milking cows are seldom grazed on land over three-quarters of a mile from the buildings. In some range areas the rainfall is so low that it requires 40 acres or more to support one cow for a year.¹ Dairy cows cannot profitably utilize such land as any reasonably large herd would have to wander too far from the buildings to graze. Because of the equipment required dairy cows cannot be moved from one area to another as easily as beef cattle so that the dairyman must obtain a regular supply of feed close to home. An abundant supply of clean water with low bacteria content for washing equipment near the buildings is important for dairying, whereas beef cattle can utilize surface water at some distance from the buildings. Man labour requirements are heaviest in dairying. This is important in times of labour shortage like wartime, but is not usually a limiting factor in peace times. Thus it is apparent that high moisture conditions with the resultant high productivity would tend to favour dairying while low productivity and recurrent drouths would tend to favour beef, or limit the dairy herd to a small size. This would explain some of the regional variations of production in Alberta as shown in Table (80).

¹ Based on data from a study of cattle ranches in Western Canada conducted jointly by the Economics Division and the Experimental Farms Service of the Dominion Department of Agriculture, 1939 to 1941, inclusive.

In addition to the effect of soil moisture on the size of dairy herd which it is possible to maintain, there seems to be some relation between soil moisture and the type of crops which will be most suitable to a particular area. The moisture available is usually a limiting factor at some part of the growing season in all soil zones in Alberta, although there are great differences in the amount of soil moisture normally available in the different soil zones. It follows then that any difference in the ability of plants to use water efficiently would be much more important in determining which crops a farmer would grow in the brown soils, where soil moisture is likely to be low, than it would be in the black or grey soils.

The relative efficiency in the use of soil moisture by plants was indicated by a study in North Dakota of the average amounts of soil moisture passing through the plants and transpiring, in order to produce one pound of dry matter, by "certain crop plants and weeds in the Northern Great Plains".¹

The two most common cereals studied may be considered as Marquis wheat and oats requiring on the average 403 and 536 pounds of moisture per pound of dry matter grown. The two main roughages studied namely brome grass and alfalfa required 784 and 798 pounds of water respectively to produce one pound of dry matter.

Thus the common roughages required nearly twice as much moisture to produce one pound of dry matter as did wheat. Crested wheat grass which is recommended for use in the dry areas because of its ability to withstand prolonged drouths, required more than twice as much moisture as wheat per pound of dry matter produced. It is reasonable to expect then that adequate moisture and control over moisture would be more important in growing forage crops than in growing cereals. Stated in reverse, the cereals, particularly wheat, are more likely to get the preference in the driest soil zones.

Table 81 gives a comparison between the irrigated farms in the Coaldale and Rosemary districts and the non-irrigated farms of the Edmonton area.

TABLE 81.—AVERAGE YIELD PER ACRE IN 1941 OF MAJOR FEED CROPS USED

	Grain		Forage crops	
	Oats	Barley	Oat bundles	Alfalfa
	Bu.	Bu.	T.	T.
58 Coaldale and Rosemary farms (irrigated).....	44.3	24.7	2.40	3.0
177 Edmonton District farms (non-irrigated).....	26.8	24.2	.94	1.3

Similar results were found in a comparison of these two districts during the previous year (1940 crop). It will be noted that while grain yielded up to one-half more on irrigated farms, the forage crops under irrigation yielded more than double those on dry land. The year 1941 was dry and the crop yields were lower in both districts than usual but since it agrees in relative yields with the previous year, the long-time relation is likely to be similar.

Since forage crops can be best utilized by the ruminants such as cattle or sheep, the relative advantage in producing forages would be expected to give some relative advantage to dairying as an enterprise. Table 82 gives a one-year comparison of results on irrigated and non-irrigated farms for the 1941-42 crop year.

¹ Dillman, Arthur C., Journal of Agricultural Research, Table 33, Washington, D.C., February 15, 1931

TABLE 82.—SUCCESS ATTAINED IN THE DAIRY ENTERPRISE

	Farms with dairy enterprise	
	Receiving costs	Not receiving costs
	No.	No.
Irrigated:—		
Rosemary cheese farms.....	12	8
Coaldale cheese farms.....	14	7
Non-irrigated:—		
Edmonton cheese farms.....	8	12
Edmonton churning cream farms.....	24	48

While prices have risen since 1941 and, in both areas, many more farms are probably clearing costs in 1944, the advantage in dairying would still be with the area having most moisture. This helps to explain the fact that the greatest increase in dairy products in recent years in Alberta have come from either the irrigated areas where dairy processing plants exist, or from the northern grey transition soils nearest to the processing plants established on the black soils.

EFFECT OF SOIL AND TOPOGRAPHY.—In addition to the differences to be found in these general zones there are very great differences in the soil and topography within each soil zone. On any particular farm there are likely to be different types of soil and there may be wide variation in the degree of slope at the land surface. From the farm operator's point of view, the significance of these variations is that with existing market conditions some of these soils will not repay the cost of cultivation over a period of years, while others will. There are also intermediate conditions where it is a question whether cultivation would pay. It was indicated in Tables 20 and 51 that the greater part of the land used as pasture was land that has never been cultivated.

Land that is suitable for cultivation may be better utilized as pasture for cattle. Since cattle can utilize that kind of land profitably, the area for possible production of cattle and their products is much larger than for cultivated crops. Hence the prices for beef or dairy products are likely to be kept down by such competition over a period of years to a point where beef cattle or processed milk production cannot compete with cash crops or hogs for the use of highly productive and tillable land, except for winter roughage or grain. The greatest number of hogs per farm are found where nearly all the land is tillable and highly productive, and the largest number of cows per farm is generally found where there is the greatest amount of rough or uncultivated land on the farm. This was indicated in the tables presented earlier.

The seeded pasture was mostly of a permanent nature and would, in most cases, represent land that was medium or low in productivity as compared with the cropland around it. In other words the best agricultural use that can be made of land that is unsuitable for relatively intensive cultivation is as pasture or semi-permanent hay land. Therefore, one of the factors likely to affect concentration on dairying, is the amount of land which is unsuitable for cultivation. The topography is an important factor inducing concentration on dairying in the foothills area west of Calgary. The effects of soil and topography on the concentration on dairy production may also be seen on many individual farms in many parts of Alberta.

Factors Affecting Choice of Market

LOCATION WITH RESPECT TO MARKET.—Whole milk is a bulky product in relation to its value. Whole milk sold as city sweet in Edmonton is the highest priced type of milk produced in Alberta and in 1944 even it commands only a little over three cents per pound. Cheese milk is the lowest priced milk sold as whole milk and it is less than two cents per pound. Therefore, neither whole milk nor cheese milk prices would justify high costs per pound for hauling and so these products must be produced close to where they are used or converted. This is accomplished by producing whole milk close to the city where it is to be sold as city sweet. In the case of cheese milk the factory is moved out to where the milk is produced. Thus cheese may be produced at a considerable distance from where it is ultimately consumed but cheese milk is always produced relatively close to the factory.

Cream is approximately only 10 per cent of the weight of the milk from which it came. At prices prevailing in 1944 cream would be worth over thirteen cents per pound assuming an average butterfat test of 34 per cent. Cream can be shipped long distances without the freight charges absorbing too much of its value. Therefore creameries tend to be located at strategic road and rail junctions and the main consideration in locating a creamery is to have a large enough territory accessible to provide the optimum volume, since the production of many more cows can be handled in a creamery than in a whole milk plant or a cheese factory of similar size.

SIZE OF HERD.—Cream is the product most commonly produced by small herds. The relation between size of herd and type of market is shown in Table 83.

When interpreting this table it is important to remember that an original minimum of four cows milking was set before a farm could be included in the study. This limit was not effective in any group except churning producers as all herds found shipping various forms of whole milk were large enough to qualify. A number of farms producing churning cream were rejected because they had less than four cows milking. The reasons behind this relation of size of herd to type of product produced is due to the concentrated nature of cream and the relative perishability of whole milk. In a district which was

TABLE 83.—RELATION BETWEEN TYPE OF PRODUCT AND SIZE OF HERD

	Size of herd			
	1939-40	1940-41	1941-42	1942-43
	(Average number of cows)			
Edmonton whole milk.....	20.5	19.4	21.0	23.0
Calgary whole milk.....			31.0	33.0
Lethbridge whole milk.....			43.0	48.1
Edmonton inspected cream.....	16.4	17.8	17.0	14.0
Calgary inspected cream.....			16.0	19.0
Churning cream.....	9.6	9.2	9.0	11.0
Cheese milk (Edmonton area).....	11.5	10.7	13.0	
Rosemary cheese milk*.....			6.6	
Coaldale cheese milk*.....			6.5	
Red Deer condensery.....				12.0

* New plant, herds had not time to build up to ultimate size.

unsuited to dairying so that the prevailing size of herd was about large enough to supply a sufficient amount of milk, cream, and butter for home use plus a little produced for sale, it would not be practical to operate a cheese factory or condensery since the volume required for economical factory operation would require that milk would have to come from too great a distance for a bulky product worth only 1.5 to 2.5 cents per pound. Furthermore the plants processing milk usually require that it be delivered every day if possible as the quality deteriorates rapidly. It is not worth a farmer's while to make delivery every day even to a truck stand unless he has a full can per day or more. Thus most of the owners of very small herds tend to produce churning cream. Large herds also may produce churning cream if, (1) they are distant from a processing plant, or (2) they have a particularly good use for the skim milk as on hog or poultry farms, and (3) if the price favours cream as compared with cheese or condensery milk. This latter is usually a temporary condition, occurring only in winter or in a period of changing price levels.

The effect of different emphasis on production between small and large herds is that large herds are kept for the income they will contribute, while the small herds may be kept largely as an alternative to retail purchase of the products used in the house. The effect of this on the results obtained in the dairy is illustrated in Table 84.

TABLE 84.—CHURNING CREAM FARMS WITH COSTS LOWER THAN WHOLESALE PRICES, BY SIZE OF HERD, 1941-42

Size of Herd (Animal Units—Cows)	Total farms	Number of farms		
		With costs lower		With costs higher
		number	percentage	
	No.	No.	%	No.
4 or 5.....	14	5	36	9
6 or 7.....	23	7	30	16
8 or 9.....	10	1	10	9
10 or 11.....	9	4	44	5
12 or 13.....	6	2	33	4
14 or 15.....	5	3	60	2
16 or 17.....	2	1	50	1
18 or over.....	3	3	100	.....
	72	26	.....	46

It may be noted that herds with cows 14 or more were producing for less than the wholesale price received in more than 50 per cent of the cases, while the smaller herds were not. The real reason for the persistence of the small herd is that price at wholesale is not the only motivating factor in small herds producing churning cream. The alternative cost of buying the dairy products needed in the house at retail, plus the serious difficulty of going to get them at regular intervals is also an important consideration. It follows then that the true comparison to make with churning cream costs in small herds is not the comparison with wholesale prices but the comparison with retail prices, plus the cost of going for these products at regular intervals to the nearest point where they would always be available, with the value of products sold at wholesale a secondary consideration.

TABLE 85.—USE MADE OF BUTTERFAT PRODUCED IN 1942-43

	Number of farms	Sold		Used in house		Fed to calves		Total milk produced	
		Average per farm	Percentage	Average per farm	Percentage	Average per farm	Percentage	Average per farm	Percentage
	No.	Lb.	%	Lb.	%	Lb.	%	Lb.	%
Edmonton whole milk....	15	6,375	92	204	3	381	5	6,960	100
Edmonton inspected cream.....	12	2,545	82	284	9	284	9	3,112	100
Lethbridge whole milk....	7	12,980	95	237	2	396	3	13,703	100
Calgary whole milk.....	31	7,729	95	166	2	252	3	8,147	100
Calgary inspected cream...	6	4,037	90	300	7	137	3	4,474	100
Condensery farms.....	49	2,541	87	171	6	213	7	2,925	100

Churning Cream

	No.	Lb.	%	Lb.	%	Lb.	%	Lb.	%
1939-40.....	108	889	65	304	22	172	13	1,365	100
1940-41.....	85	1,234	64	460	24	224	12	1,918	100
1941-42.....	72	1,273	66	427	22	230	12	1,930	100
1942-43.....	30	1,922	81	239	10	207	9	2,368	100

HOME USE OF PRODUCTS.—Another factor determining the type of market preferred by farm operators is the effect of the distance from a retail purchasing centre on home use of the products. The use made of milk produced on farms co-operating in the study is given for four years on churning cream farms and for 1942-43 by other groups in Table 85.

Since the purpose was to study commercial dairy production rather than that influenced mainly by home needs, a number of the smaller churning cream herds were eliminated before the second year of the study. However there tends to be some relation between the size of the family unit including hired help and the number of cows milked on churning cream farms.¹ Thus while the total production on churning cream farms averaged higher in the second year so did the home use. The percentage used at home remained practically constant.² In the third year of the study there was approximately the same production of butterfat per farm but the amount used at home decreased. (Table 85) The reasons for this trend, which started in 1941-42, appear to have been: (1) the increasing scarcity of help for the farm home, and (2) the shifts in prices of butterfat and butter which were making it relatively profitable to sell butterfat. The reason for (2) is that costs at a creamery do not vary as much as prices. The most highly variable factor in creamery production would be salaries and wages. C. V. Parker of the Department of Agriculture, Ottawa, in *An Economic Analysis of Creamery Operations in Manitoba, Saskatchewan, and Alberta* indicated that salaries and wages made up only around 34 per cent of the total creamery costs. This would have increased during the war but its effect would be partially offset by the reduction of services rendered, such as duplicate truck routes and by the effect of increased volume which most plants are enjoying. As a simple rule of thumb some creamery managers estimate that the 25 per cent overrun on the fat purchased which is normally obtained will pay their cost of operation if the price of butter is 30 cents or more. If it is less than 30 cents then they need more than the overrun to meet expenses.¹ Thus a farmer is likely to find the price of butterfat, which he can sell, higher in relation to retail butter prices when prices are high than when they are low.

¹ Unpublished data from this study.

² Observations by dairy inspectors.

This relationship plus a tendency to scarcity of labour required for home butter-making tended to reduce the amount of home-produced butter and butterfat consumed on the farms in the 1941-42 account year. In July of 1942 the Dominion Government bonus of six cents per pound of butterfat delivered to creameries was introduced. Since then the bonus has been increased. The bonus is only paid on butterfat delivered at creameries and the effect has been to further decrease the production of dairy butter for home use and to further increase the amount sold. The effect of the bonus was to accentuate the tendency to sell butterfat. This is apparent from the 1942-43 data in Table 85.

Part of the reason for variation in the butterfat used at home for house use or feeding calves is the size of the farm herd and farm business. For example, in Table 83 is given the average number of cows kept by market groups. The Lethbridge area had over 40 cows per herd so that it is natural that they should feed the most butterfat to calves in the form of whole milk. However, on the basis of percentage of total production fed, the Lethbridge whole milk shippers fed less to calves than was the case in several other groups. Owing to the large size of their businesses and the large numbers of workers engaged the Lethbridge whole milk farms used more butterfat in the house than any other group except the churning cream producers. All dairy producers in the Alberta study obtained their whole milk from their own dairy herd. The inspected cream shippers also obtained cream for house use and it is noticeable in Table 85 that the inspected cream shippers used more butterfat in the house than the corresponding groups of whole milk shippers. In the 1939-40 account year practically all churning cream farms made their own butter. This resulted in a situation where 476 pounds of butterfat, or more than two cows' production at the average rate of 217 pounds per cow, were used at home. Since the small herds could not justify the expense of keeping a herd sire around all year,¹ and since the owner is not prepared to give much attention to an enterprise that contributes only a small part of his income, there is usually very poor control over the breeding program in small herds, and the time at which cows would freshen to supply family needs. Therefore, the easiest way for the churning cream producer who is mainly concerned with supplying his home needs, is to keep about twice as many cows as he would need for his own use and then there are likely to be some cows producing every month of the year. When he has a surplus he can sell it. This would explain some of the wide variations found in churning cream deliveries at creameries, indicated in Table 86.

REGULARITY OF SALES.—In 1943 about three times as much butter was made in Alberta creameries during June and July as in December in spite of the fact that some cream producers now produce most of their cream in winter.

TABLE 86.—ALBERTA CREAMERY BUTTER PRODUCTION ²

Month	1943 Pounds	Percentage of years' production
January.....	1,906,370	4.9
February.....	1,901,742	4.9
March.....	2,235,601	5.8
April.....	2,680,811	6.9
May.....	3,746,253	9.7
June.....	5,505,889	14.3
July.....	5,657,591	14.7
August.....	4,886,053	12.6
September.....	3,705,052	9.6
October.....	2,662,623	6.9
November.....	1,978,970	5.1
December.....	1,789,985	4.6
Total year's production.....	38,656,904	100.0

¹ A statement commonly heard from farmers with small herds. Supported by the fact that most of them do not keep a bull the year round.

Adapted from "Annual Report of the Dairy Commissioner", page 14, Province of Alberta, 1943.

TABLE 87.—THE EFFECT OF PRODUCING MILK IN WINTER, 1942-43

Percentage of milk shipped in winter	Number of farms	Average labour earnings	Cost per pound of butter-fat	Value of feed fed per dairy animal unit	Butter-fat sold per cow	Percentage of milk shipped in winter	Returns per \$100 worth of feed fed
%	No.	\$	¢	\$	Lb.	%	\$
Whole milk Farms:—							
Less than 50.....	29	2,907	62	51	250	46	272
50 or more.....	24	2,550	65	61	259	52	244
Cream Farms:—							
Less than 40.....	13	741	68	38	189	34	192
40 to 49.....	21	1,162	51	42	235	45	215
50 or more.....	14	2,339	57	41	194	55	189
Condensery Farms:—							
Less than 40.....	19	265	76	39	174	31	189
40 to 49.....	19	1,212	59	51	255	45	213
50 or more.....	11	811	61	41	213	54	230

A comparison of the regularity of shipment between the whole milk, cream, and condensed milk farms may be gained from Table 87. The winter months were taken to be November to April, inclusive. This gives six months of winter and six months of summer. It may be noted from Table 87 that while 24 out of 53 whole milk farms shipped 50 per cent or more in winter, only 14 out of 48 cream farms were shipping 50 per cent or more in winter and 11 out of 49 condensery farms shipped 50 per cent or more in winter. The whole milk farms shipping less than 50 per cent in winter still had an average of 46 per cent shipped in winter while some of the churning cream and condensery farms shipped very little during the six months of winter.

Enterprises that Operate Well Together

WHOLE MILK ENTERPRISES.—Whole milk production is a specialized business. Milk must be delivered every day early enough to give time for the plant to weigh the milk in, standardize it, and bottle it ready for the next day's delivery. The milk must be low in bacteria as whole milk is highly perishable; and the supply must be steady the year around. These requirements impose problems which no farm operator would be bothered trying to control unless his return over a period of years is large enough to justify his exacting daily routine as a whole milk shipper. The time of getting the milk to market, the cleaning of the utensils and of the barn must come first on a whole milk shipping farm. In an emergency all other farm enterprises must be relegated to second place. It will be seen in Table 88 that on the average the whole milk farms derive from 60 to 68 per cent of their income from the dairy. This is the direct result of the exacting conditions imposed, to ensure a high quality supply of a highly perishable product at regular intervals, since no farm operator could afford to meet all those conditions unless he has a big enough enterprise to make it worthwhile. Furthermore any enterprise kept on a farm with whole milk must be of such a nature that it can be temporarily neglected in case of an emergency in the dairy. This means usually that all other enterprises on whole milk farms are relegated to secondary place except on a few large farms where it is possible to keep one part of the labour force at the dairy and another part on field work with a possibility of switching some extra labour between enterprises as needed. The peak load of labour in the dairy comes night and morning, and in the winter rather than the summer. In whole milk production the herd must be relatively

large but if the farm is large enough to permit a good sized dairy herd as well as other large enterprises, crops fit in particularly well. The dairy work is lightest in summer when crops must be grown. Hogs or poultry can be fitted in very nicely as most of the work on these two enterprises comes between the milking periods and they can be left for a few hours if necessary. Poultry is more easily combined with whole milk than with other types of dairying because the location with respect to market is better and the eggs can be delivered daily with the milk if a premium for freshness is offered.

TABLE 88.—DIVERSITY AS INDICATED BY PERCENTAGE OF RECEIPTS FROM IMPORTANT ENTERPRISES, 1941-42

—	Number of farms	Crops	Hogs	Dairy	Dairy returns per hour of labour
	No.	%	%	%	\$
Calgary whole milk.....	35	5	5	66	.43
Lethbridge whole milk.....	8	13	6	68	.25
Edmonton whole milk.....	42	4	11	60	.33
Edmonton inspected cream.....	43	9	27	39	.22
Edmonton churning cream.....	72	11	36	30	.19
Edmonton cheese.....	20	11	27	44	.20
Rosemary and Coaldale cheese.....	50	30	22	28	.38
Condensery (1942-43).....	49	8	22	42	.21

The percentage of receipts from important enterprises for all groups is shown in Table 88. It may be noted that on whole milk farms the dairy provided approximately two-thirds of the receipts and no other enterprise could be considered a serious rival in the average farm organization.

PROCESSED MILK ENTERPRISES.—The condensery, cream and cheese farms shown in Table 88 provide a different picture. In all of these groups hogs provide an important part of the receipts and in the case of churning cream farms the hogs provided a higher proportion of the receipts than the dairy in spite of the farms being selected as commercial dairy farms. Crops provided more income than dairy on the Rosemary and Coaldale cheese farms. This was partially due to the intensive crops like sugar beets at Coaldale and the recent development of dairying. The factories had been operating less than two years when the study began and nearly all dairy herds were being built up but had not yet attained optimum size. The cheese and condensery milk farms usually tend to stress the dairy more than the other enterprises.

The necessity of getting the milk out to a milk stand or cheese factory every day is a disadvantage to a farm that has other large enterprises with peak loads of labour required at critical periods of operations. Churning cream then has many advantages as an enterprise to dovetail well with other enterprises. While the milking must be done night and morning, there is no critical period within which it must be done and the time can be adjusted to suit the requirements of other enterprises, especially if the herd is small.

On the other hand a cream shipper has the milk to separate and the separator to wash. Cheese milk shippers frequently ship cream in winter when their cows are largely dried off and this means that they too must maintain a separator and wash it daily when in use. It is difficult to appraise just how important this extra work of separating may be, but according to some of the condensery

shippers, the work required by the cream separator was a determining factor in favour of their decision to ship whole milk to a condensery. Washing the separator is looked upon as one of the most disagreeable jobs in producing cream. In studies made in Oregon from 1929 to 1933 ¹ it was indicated that the cost of separating milk was 14 cents per hundredweight of skim milk with labour averaging from 19 to 22 cents per hour.

The sale of milk affects many other enterprises on the farm besides the dairy enterprise. In Table 89 the effect of size of hog enterprise during the years 1942-43 is given. The difference in numbers of hogs kept is quite marked. On the whole milk farms nearly half of the farms kept no hogs. Three-quarters of them kept less than 10 animal units of hogs. Of the farms shipping to the condensery about half had less than 10 animal units. Only one-quarter of the churning cream farms kept less than ten animal units of hogs. The size of the hog enterprise seemed to have more effect on labour earnings on the churning cream farms than on the whole milk or condensery milk shipping farms. •

TABLE 89.—THE EFFECT OF SIZE OF HOG ENTERPRISE, 1942-43

Animal units of hogs per farm	Number of farms	Average labour earnings	Animal units of cows per farm	Average animal units of hogs per farm	Average total animal units per farm
	No.	\$	A.U.	A.U.	A.U.
Whole milk Farms:—					
No hogs.....	23	2,493	33	0	51
1 to 7.....	15	2,627	33	4	59
8 or more.....	15	3,250	31	18	73
Cream Farms:—					
Less than 10.....	11	695	13	7	33
10 to 19.....	19	1,087	12	15	43
20 to 29.....	11	1,555	13	24	93
30 or more.....	7	3,055	12	38	81
Condensery Farms:—					
No hogs.....	7	383	12	0	22
1 to 9.....	17	761	12	4	28
10 to 19.....	20	802	12	14	46
20 or more.....	5	1,067	15	36	71

An advantage of the "churning cream" type of dairy farming is usually that the peak loads of labour come early and late in the day, and in winter more than in summer. This makes it a good enterprise to combine with "crops" or "livestock" enterprises in which labour requirements are heaviest through the day and in summer rather than in winter. For this reason farm operators may be prepared to accept a lower return per hour of labour from churning cream dairying over a period of years than they would accept from crops which are highly seasonal or from other livestock enterprises which do not dovetail as well with other important enterprises. They can afford to take less per hour from

¹ Selby, H. E., *et al*, "Cost and Efficiency in Dairy Farming in Oregon", Bulletin 318, Agricultural Experiment Station, Oregon State Agricultural College, Corvallis, Oregon, September, 1933.

the churning cream enterprise and still add to their income by producing it as an alternative to doing nothing in time not utilized by the other major farm activities. This would be particularly true of winter dairying where the cows freshen in the fall and dry off during harvest. Some of the most successful churning cream producers now follow this practice.

Factors Affecting Earnings

AVERAGES VERSUS HIGH PRODUCTION.—The production per cow on a herd average base is shown in Table 90. This table indicates that there are distinct differences between the averages of different groups of producers; however there are individuals in every group who would be high in production per cow no matter what group they were compared with. If the whole milk and churning cream farms are compared for example, the top producing farms in each group are not so far apart on production per cow as the average of all farms in these groups. In other words, the reason that the whole milk farms show higher average production per farm is because they have a higher percentage of the farms that have high producing herds rather than a few outstanding herds.

TABLE 90.—THE HERD AVERAGE OF BUTTERFAT PRODUCED PER COW BY GROUPS AND YEARS

	Number of farms	Average butterfat per cow	Highest butterfat per cow
	No.	Lb.	Lb.
Edmonton Whole Milk Farms:—			
1939-40.....	47	296	423
1940-41.....	45	291	412
1941-42.....	42	296	395
1942-43.....	15	301	387
Edmonton Inspected Cream Farms:—			
1939-40.....	51	233	366
1940-41.....	49	243	365
1941-42.....	43	224	376
1942-43.....	12	223	355
Northern Churning Cream Farms:—			
1939-40.....	108	217	334
1940-41.....	85	217	389
1941-42.....	72	215	358
1942-43.....	30	223	362
Northern Cheese Farms:—			
1939-40.....	30	217	339
1940-41.....	25	215	331
1941-42.....	20	212	304
Calgary Whole Milk Farms:—			
1941-42.....	35	264	355
1942-43.....	31	249	363
Lethbridge Whole Milk Farms:—			
1941-42.....	8	270	454
1942-43.....	7	285	337
Irrigated Cheese Farms:—			
Coaldale } 1942-41.....	21	262	352
Rosemary } 1941-42.....	29	196	334
Condensery Farms:—			
1942-43.....	49	237	398

VARIATION IN AVERAGE ACHIEVEMENT.—In Table 91 is given the cumulative effect of factors affecting labour earnings on farms as found in 1940-41.

TABLE 91.—CUMULATIVE EFFECT OF FIVE FARM MANAGEMENT FACTORS¹ EDMONTON DISTRICT FARMS, 1940-41

Number of factors high	45 Whole milk farms		49 Inspected cream farms		85 Churning cream farms		25 Cheese milk farms	
	Number of farms	Average labour earnings	Number of farms	Average labour earnings	Number of farms	Average labour earnings	Number of farms	Average labour earnings
	No.	\$	No.	\$	No.	\$	No.	\$
0.....	3	348	1	-282	8	-15	5	-98
1.....	10	698	11	324	18	170	6	276
2.....	9	611	18	471	18	538	7	345
3.....	9	1,387	8	1,075	20	726	2	488
4.....	11	1,780	8	1,401	16	1,218	5	1,984
5.....	3	3,857	3	2,056	5	2,472	.....	.....
High in size and low in everything else.....	3	1,098	3	-93	2	-683	1	-181

Factors:

- (1) Livestock Efficiency
- (2) Crop Efficiency
- (3) Labour Efficiency
- (4) Capital Efficiency
- (5) Size of Business

Measure of Efficiency Used

Butterfat per Cow
Crop Yield Index
Receipts per Man
Years for Cash Receipts to Equal Capital
Crop Acres

In this table it will be seen that the factors affecting earnings are the same in principle for all classes of producers. The only difference between the groups in Table 91 is that each group was measured in terms of its own average achievement. It can be seen in Table 90 that the average achievement in production per cow varies considerably in different market groups. The other four factors used in Table 91 also had different averages in each group.

These differences are the result of the numerous physical and economic conditions with which the farm operators must contend. It is hoped that many of these conditions have been made clearer in this report, and that with better understanding there will be greater ability to overcome the difficulties and take advantage of favourable conditions to the end that all may benefit.

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